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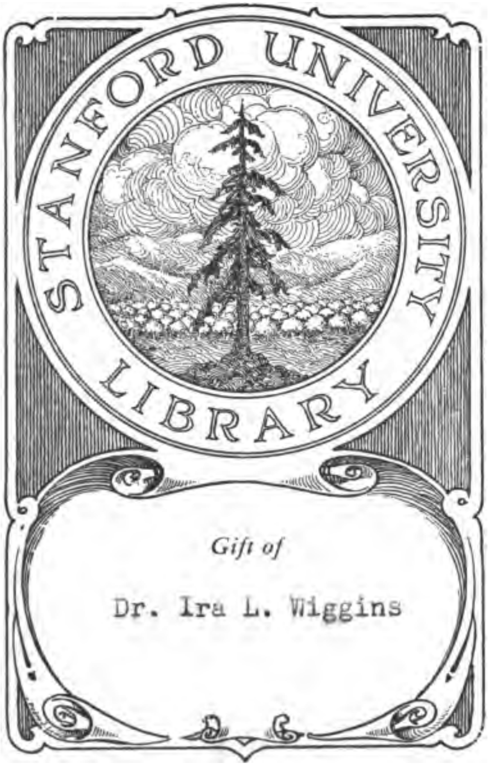

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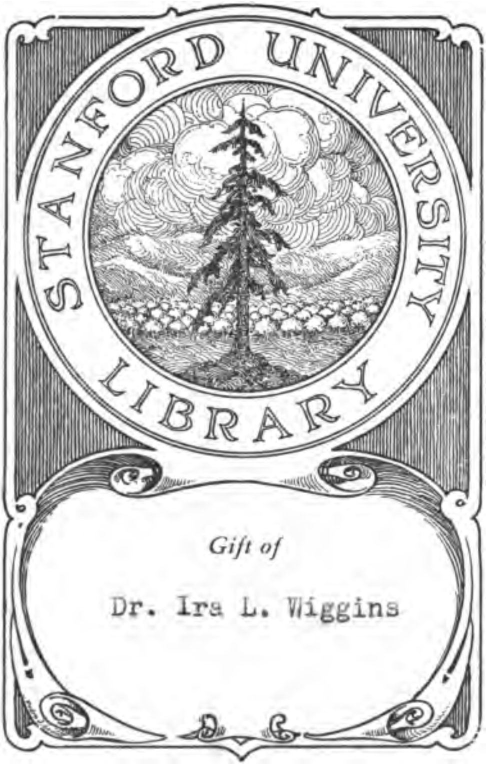

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American Fern Journal

A QUARTERLY DEVOTED TO FERNS

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⁂

R. C. BENEDICT
Editor

E. J. WINSLOW
Managing Editor

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American Fern Journal

Vol. 4 JANUARY-APRIL, 1914 No. 1

Braun's Holly Fern

BY STEWART H. BURNHAM.

The following records of this beautiful fern are in part gathered from printed notes which are not available to the majority of fern students. My first pressed specimen of *Polystichum Braunii* (Spenner) Fée for my herbarium was secured from Rev. Jas. A. Bates, collected at Baintree, Vt., September, 1895. Mr. J. C. Buchheister, of New York City, afterwards sent me specimens which he collected 30 July 1899, in a wild stony, but at same time, moist woods on Belle Ayr Mt., Ulster county, in the Catskill mountains at an altitude of 2500 to 3000 feet.

It was not until the fall of 1902, that I was aware that it grew near the shores of Lake George. One evening while calling at the home of Prof. J. F. Kemp, of Columbia University, who had been doing field work in geology during the summer in the vicinity of Silver Bay, Prof. Kemp laid out on the floor a magnificent complete pressed specimen with fronds two feet long, which he had collected on the talus in the Ice George north-west of Silver Bay at an altitude of about 1500 feet. This fine specimen is preserved in my herbarium. Prof. Kemp said the fern was not common in this cool ravine, where ice may be obtained from beneath the rocks until late in the summer.

I first saw and collected the plant at the twelfth annual field meeting of the Vermont Botanical Club on

[No. 4 of the JOURNAL (4: 96–124, was issued Dec. 30, 1913.]

Mt. Mansfield. It was pointed out to me near the wagon road, the 4th of July 1906, during the ascent of the mountain in a rain-storm; and was said to be the only locality near the road outside of Smugglers Notch. The following day I collected a few plants near the spring in Smugglers Notch; and dug up three or four plants to transplant in my wild garden; these plants lived for about five years but finally succumbed to the effects of too strong light and droughts. It was said not to be as abundant here as formerly; before a vandal florist dug up and carried off barrels of fern roots to sell. This is said to be the type station for this fern in America, being found here by Frederick Pursh in 1807. It grew in rich shaded soil; but plants were seen along the base of the upper cliffs and also in rock crevices. In my herbarium there is a specimen from this locality, Stowe, Vt., August 1864—collector unknown.

The 14th of June 1907, in company with Frank Dobbin, of Shushan, N. Y., we climbed Mt. Equinox, near Manchester, Vt. Descending the mountain wesward through Corbett's Hollow on the Sandgate side, we found three plants of Braun's Holly Fern near the lower end of the ravine. Previous to this but one specimen of this fern had been recorded as growing on the mountain, collected at the ninth annual field meeting of the Vermont Botanical Club, 4th of July 1903, as the party were descending the steep eastern slope of the mountain to Manchester.*

The 10th of October 1909, I saw one fine plant of this fern on Mt. Greylock, Mass., low down in the "Inner Hopper" along the stream. Previous to this Ralph Hoffmann, in August 1904, found several plants of *Aspidium aculeatum* Swartz., var. *Braunii* Koch along "the mountain brook which comes down the north side of Greylock"* The 29th of May 1910, I found a few scattering plants of the fern along the stream in the "Heart of the Greylock," low down, not far from the old Goodale house. I believe Mt. Greylock still remains the only station for this fine fern in Massachusetts.

---

* Rhodora **5**: 236. Sept. 1903.

Mrs. Elizabeth Watrous of New York City discovered this beautiful fern, about 15th of June 1904, near her summer home at Hague, Lake George, in a wild rocky ravine called Hosie Gulch, where it grows in company with large plants of Goldie's Fern, *Dryopteris Goldiana* (Hook.) A. Gray. This information she communicated to Dr. Chas. H. Peck, State Botanist. The 16th of July 1907, Mrs. Watrous presented two or three fine specimens to the New York State Herbarium at Albany. The altitude of this cool ravine is about 1000 feet; or 700 feet above the Lake. Prof. Kemp's station is not many miles distant from Hosie Gulch, and on the same mountain range.

Two other sheets are preserved in the State Herbarium at Albany. A large specimen from the Catskills collected by Chas. H. Peck; also a sheet of small plants from the Catskills collected by Peck.

I believe the first printed record of this fern occuring in New York State is in Dr. John Torrey's N. Y. State Flora.† It is called *Aspidium aculeatum* Swartz. Prickly Shield Fern. "Mountains of Essex county (Dr. W. F. Macrae)." Dr. Torrey says, "I was not so fortunâte to find this interesting fern when I explored the Essex mountains; neither was it detected by Dr. Knieskern, in his subsequent visit to that region. My specimens are from the Green Mountains of Vermont

---

*Rhodora **6**: 203. Oct. 1904.

† Flora of the State of New York **2**: 298. 1843.

(where the plant was first found in America, by Pursh), and the White Mountains of New Hampshire; the former kindly communicated by Dr. W. F. Macrae, the latter by Mr. Tuckerman; both presenting an exact resemblance to the European *A. aculeatum.*"

During the year 1869, Dr. Chas. H. Peck collected this fern in the Catskills.* "*Aspidium aculeatum* v. *Braunii* Koch. Stony Clove, Catskill mountains. Discovered there by J. H. Redfield. This locality is evidently very favorable to the growth of ferns. In July last, the following nineteen species were observed while passing along the road, about the distance of half a mile, and in no case going more than four rods from it:

Polypodium vulgare L.
Adiantum pedatum L.
Pteris aquilina L.
Asplenium thelypteroides Mx.
A. filix-foemina Bernh.
Phegopteris polypodioides Fee.
P. dryopteris Fee.
Cystopteris bulbifera Bernh.
C. fragilis Bernh.
Aspidium thelypteris Swartz.
Aspidium spinulosum Swartz.
A. marginale Swartz.
A. acrostichoides Swartz.
A. aculeatum Swartz.
Struthiopteris germanica Willd.
Onoclea sensibilis L.
Woodsia ilvensis R. Br.
Dicksonia punctilobula Kze.
Botrychium virginicum Swartz.

"The whole number of species now known to belong to the State is forty-four, excluding the doubtful inhabitant *Lygodium palmatum*. It will thus be seen that nearly half our species occur in the Stony Clove." Not many years afterwards, Miss M. C. Reynolds discovered the rare Climbing Fern in Greene county.†

Dr. Peck, in his Remarks and Observations on New York State plants, speaking of his fern, says:

"*Aspidium aculeatum* Swartz. This very rare fern was reported from the Adirondack Mts., many years ago by Dr. W. F. Macrae, but until the present season, had not since been found there. In a recent botanical tour I detected it in two localities; one in the ravine below Rainbow Falls, near the outlet of Lower Ausable Lake, the other at the base of Bartlett Mt. Probably it occurs in other places east of Mt. Marcy and in the ravines of the Gothics."[*]

---

* N. Y. State Mus. Rept. **24**: 101. 1872.
† N. Y. State Mus. Rept **28**: 84. 1876.

"*Aspidium aculeatum* var. *Braunii* Koch. Abundant in the 'Deep Notch' between Shandaken and Lexington. Eighteen species of ferns were observed in this locality, all except three of which had previously been noticed in 'Stony Clove,' a locality similar to this and but a few miles south of it. The three species are *Woodsia obtusa, Asplenium Trichomanes* and *Osmunda cinnamomea.* These two localities together produce one-half the whole number of ferns that occur in the State."[†]

"*Aspidium aculeatum* Sw., v. *Braunii* Koch. This beautiful fern proves to be more common than was at first supposed. I have observed it in three new localities the past season. Near Summit, Schoharie county; near Griffins, Delaware county; and in the Catskill Mountains, near Big Indian."[‡]

Prof. B. D. Gilbert in his "Fern Flora of New York" speaks of a specimen of this fern from "Ilion ravine, Rev. H. N. Simmons in herb. Gilbert."[**]

Mrs. Frances Theodora Parsons in "How to Know the Ferns" says that this fern has been found in Oswego county, N. Y.

HUDSON FALLS, N. Y.

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[*] N. Y. State Mus. Rept. **25:** 107–108. 1873.

[†] N. Y. State Mus. Rept. **26:** 89. 1874.

[‡] N. Y. State Mus. Rept. **31:** 53. $879.

[**] Fern Bulletin **11:** 102. Oct. 1903.

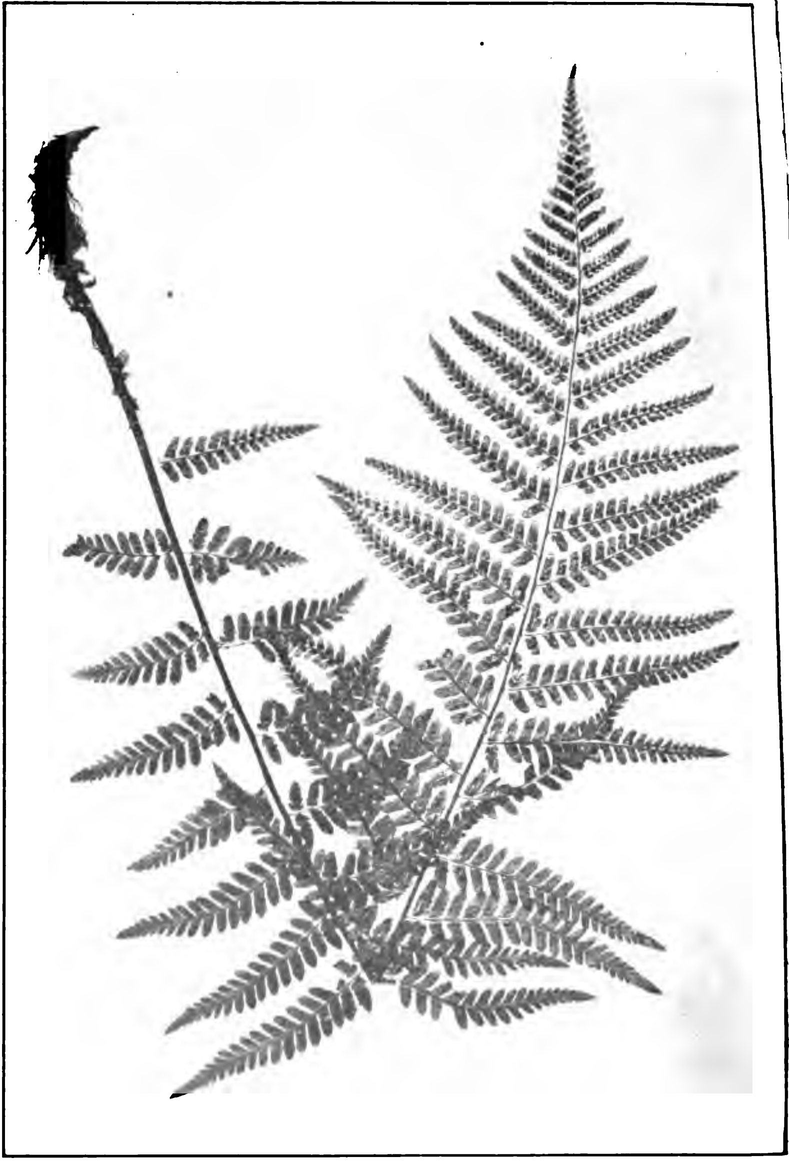

PLATE No. 9. *Dryopteris filix-mas* × ⅛.
(Photograph by courtesy Smithsonian Institution)

The Ferns of Washington

T. C. FRYE AND MABEL MCMURRY JACKSON

(Continued from AMERICAN FERN JOURNAL, Vol. 3, No. 4, page 108, November–December, 1913.)

DRYOPTERIS (ASPIDIUM). SHIELD FERN.

Leaves membranous, continuous with rootstock; petiole more or less covered with chaffy brown scales; veins free. Sori round; indusium present, flat, cordate to reniform, attached by center. (Greek *dryas* = an oak, *pteris* = a fern; from the forest habitat of some species.)

A. Leaf-blades with narrow base, 1-pinnate, obovate or oblanceolate; veins simple or once forked; primary leaf-divisions deeply toothed or lobed, but otherwise almost entire. 1. *D. oreopteris.*

AA. Leaf-blades with broad base, 2–3-pinnate; veins freely forked.

B. Leaf-blades 2-pinnate, base slightly narrowed; leaflets deeply and doubly serrate. 2. *D. filix-mas.*

BB. Leaf-blades 3-pinnate, widest at base; leaflets serrate. 3. *D. dilatata.*

1. DRYOPTERIS OREOPTERIS (ERHR.) MAX. (Figs. 47, 48.)

Leaves 1- but nearly 2-pinnate; petiole short; blade 12–15 inches long; obovate or oblanceolate, its lower surface smooth and shining; leaflets divided nearly to mid-vein, their lowest division longer than the rest; veins free, seldom forked. Sori very minute, near edge of divisions, on backs of veins.—Alaska to Washington; Europe; Asia.

2. DRYOPTERIS FILIX–MAS (L.) SCHOTT. (Figs. 46, 49, 50.)

Male Fern.

Leaf-blades broadly oblong to lanceolate, 2-pinnate, slightly narrowed toward the base; leaflets oblong, smooth, shining beneath, the larger ones pinnately incised. Indusium convex.—Alaska to Labrador, south to California, Michigan, Nova Scotia; Europe.—The rhizome is a well known worm medicine.

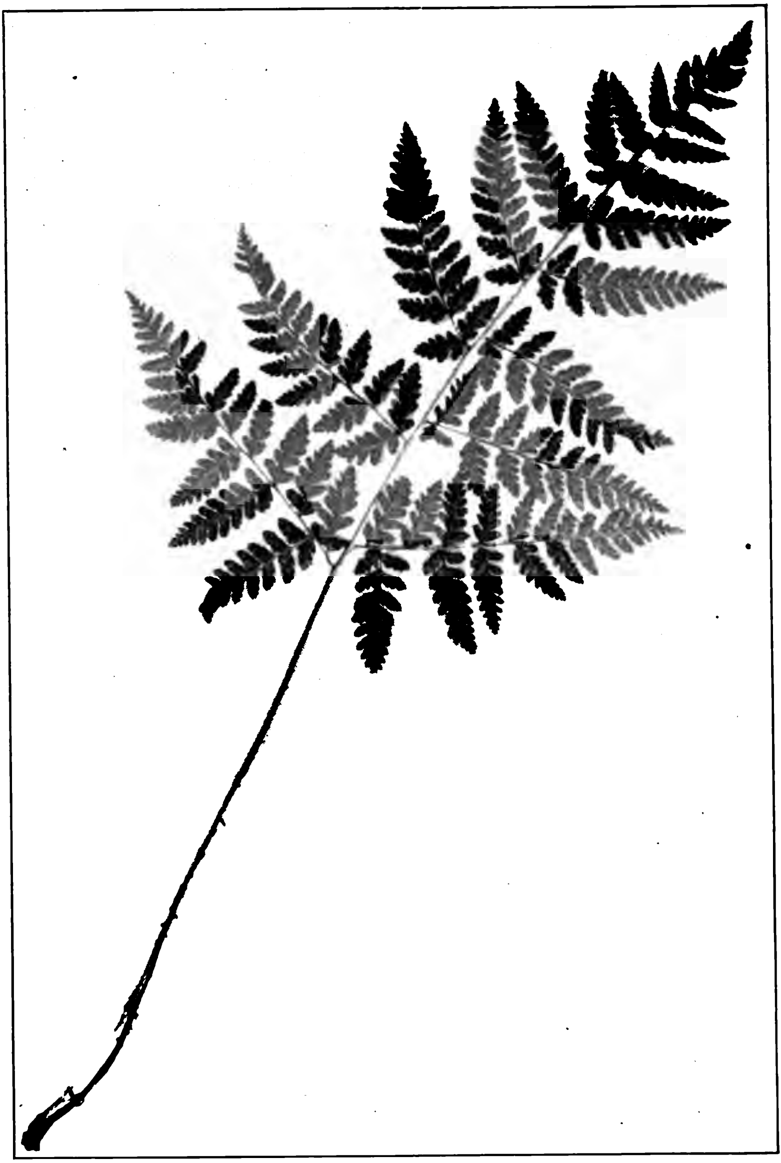

PLATE NO. 10. Dryopteris dilatata × ¼.

3. DRYOPTERIS DILATATA (Hoffm.) Gray. (Figs. 45, 51, 52.)

Mountain Wood Fern

Leaf-blades broadly ovate, 3-pinnate, widest at base, 8–22 inches long; petioles 7–18 inches long; leaflets oblong, toothed to serrate.—Usually at high altitudes. Alaska to Labrador, south to California, Montana and Virginia; Europe; Asia.

POLYSTICHUM.

Leaves mostly large or medium sized, tufted; leaf-blades linear to lanceolate, 1–2-pinnate; petioles more or less scaly at base; leaflets numerous; veins all free. Sori only on the outer half or less of the leaf, round, borne on the back of the veins; indusium round, flat, peltate. (Greek *poly* = many, *stichos* = a row; because the sori are in several rows in some species.)

A. Leaves 1-pinnate, distinctly spinulose-dentate.
  B. Petiole very short; leaflets triangular to broadly lanceolate. 1. *P. lonchitis.*
  BB. Petiole of medium length; leaflets linear to lanceolate.
    C. Leaves 2–5 feet long; leaflets at right angles to leaf-axis, not overlapping. 2. *P. munitum.*
    CC. Leaves 1–2 feet long; leaflets oblique to leaf-axis, overlapping. 3. *P. munitum imbricans.*
AA. Leaves 2-pinnate, not spinulose-dentate.
  D. Sori few. 4. *P. Lemmoni.*
  DD. Sori many. 5. *P. scopulinum.*

1. POLYSTICHUM LONCHITIS (L.) Roth. (Figs. 54, 60, 61.)

Holly Fern.

Leaves scaly along petiole and leaf-axis and mid-vein of leaflets; leaf-blade 1-pinnate, linear, 12–20 inches long, scarcely petioled, hairy beneath; leaflets ¼–¾ inch long, triangular or broadly lanceolate, auricled on upper side, margin densely spinulose-toothed. Sori very close together, one row on each side of the mid-vein.—Subarctic regions southward to California, Colorado and New Mexico; Europe; Asia.

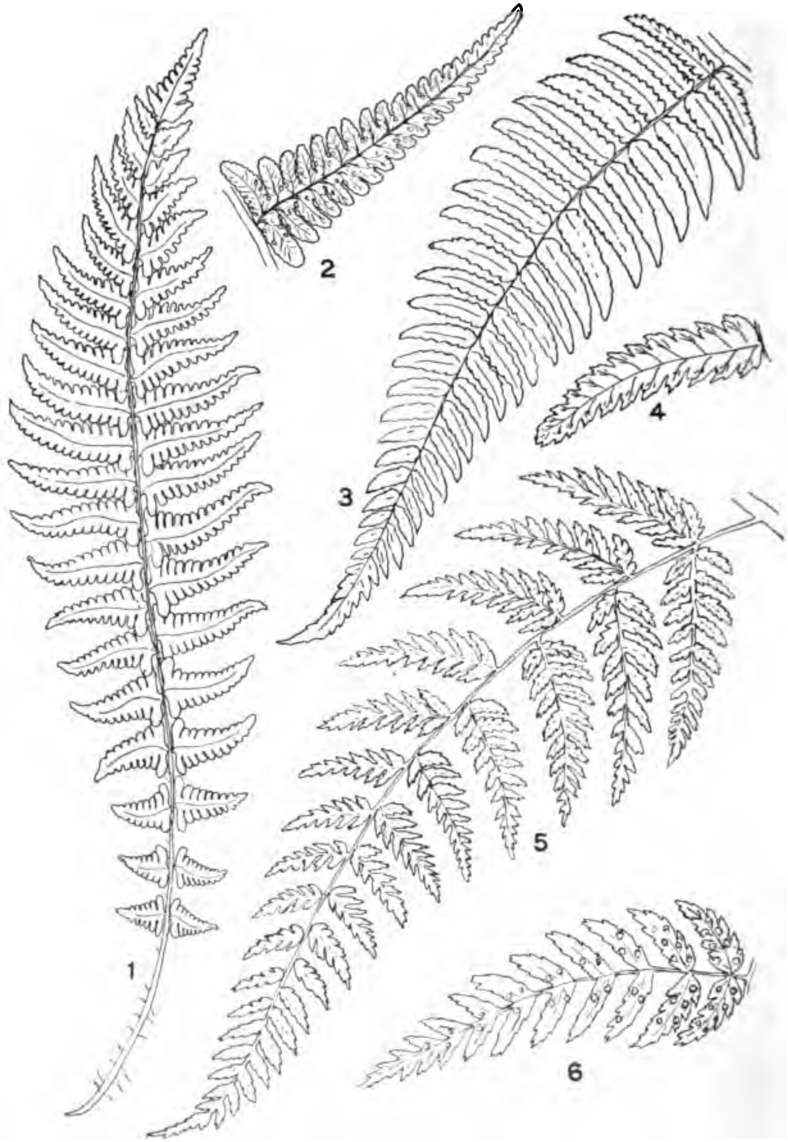

PLATE No. 11.

1, 2 *Dryopteris oreopteris;* 1 = a leaf, × ¼; 2 = a primary leaf-division, × ½. 3, 4 = *Dryopteris filix-mas;* 3 = a primary leaf-division, × ½; 4 = a leaflet, × 1. 5, 6 = *Dryopteris dilatata*; 5 = a primary leaf-division, × ½; 6 = a secondary leaf-division, × 1.

2. **POLYSTICHUM MUNITUM** (Kaulf.) Presl. (Figs. 53, 56, 67.)

Sword Fern.

Leaves 2–5 feet long, with petiole and leaf-axis and mid-vein of leaflets scaly; petiole of medium length; leaf-blade lanceolate, 1-pinnate; leaflets horizontal, linear, strongly auricled on the upper side, spinulose-serrate. Sori close together, one row between the margin and mid-vein, nearer margin.—Alaska to Idaho and California.—Much used for decorating because it is large, tough and evergreen.

3. **POLYSTICHUM MUNITUM IMBRICANS** (Eat.) Max. (Figs. 58, 59.)

Leaf-blades lanceolate, 1–2 feet long; leaflets oblique to the mid-vein, overlapping, broadly lanceolate.—On dry rocky slopes of mountains. Washington to California.

4. **POLYSTICHUM LEMMONI** Underw. (Fig. 62.)

Leaves 2-pinnate or partly so, 6–12 inches long, densely tufted, very scaly at base, slightly so above; petioles of medium length; primary divisions ovate, rounded at ends, consisting of 6–10 oval obtuse crenate divisions or leaflets besides the terminal one. Sori small, few, 1–2 to each leaflet or division.—In high altitudes. Alaska to California.

5. **POLYSTICHUM SCOPULINUM** (Eat.) Max. (Fig. 63.)

Leaves 1–2 feet long; petiole nearly as long as the blade; blade lanceolate, 2-pinnate below; scales on rachis small and few, at base of petiole large and many; primary leaf-divisions divided at base, serrate with incurved teeth, blunt or rounded at tip. Sori 1–6 on each leaflet or lobe of primary leaf-division; indusium large, more or less lobed.—Washington and Idaho to California.

[To be Continued.]

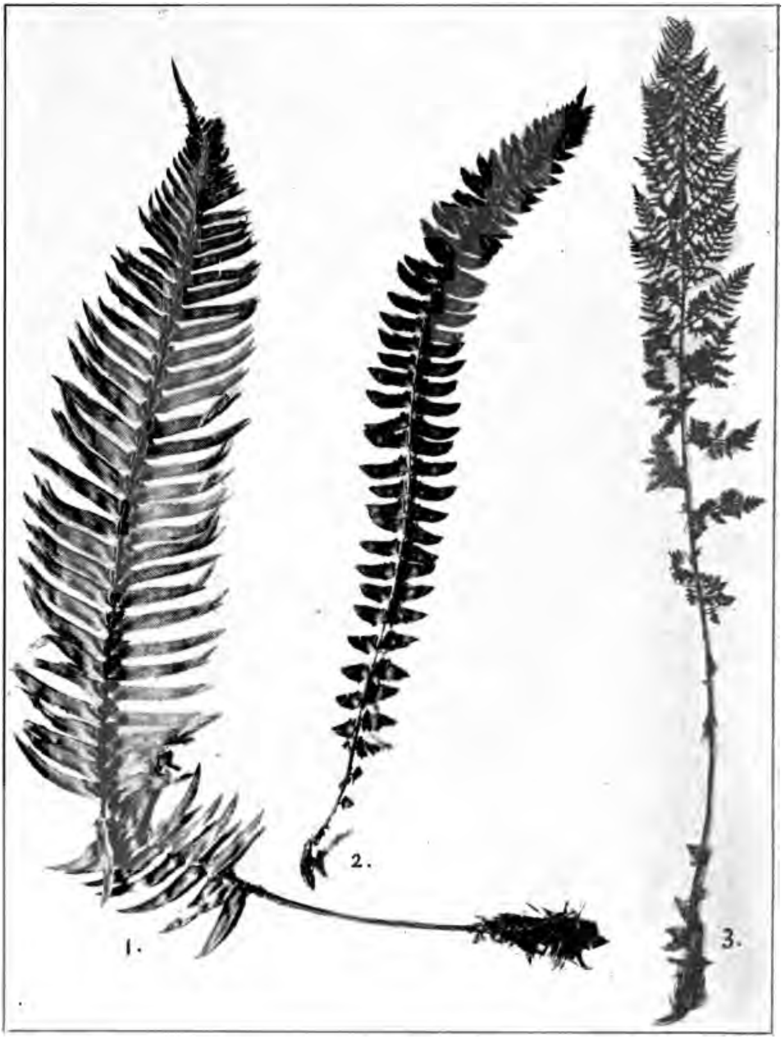

PLATE No. 12.

1 = *Polystichum munitum* × ⅓; 2 = *P. Lonchitis* × ⅓; 3 = *Phegopteris alpestris* × ⅓.

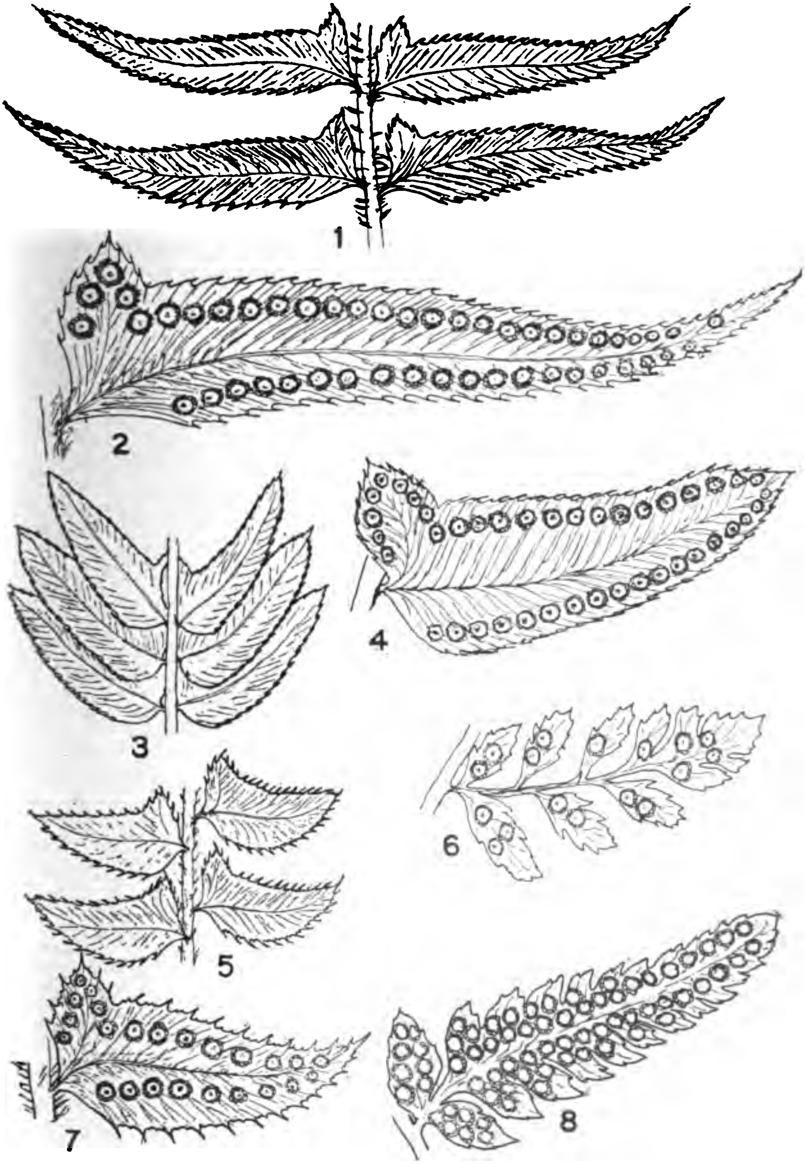

Plate No. 13.

1, 2 = *Polystichum munitum;* 1 = a portion of a leaf-blade, × ½; 2 = a leaflet, × 1. 3, 4 = *Polystichum munitum imbricans;* 3 = portion of a leaf-blade, × ½; 4 = a leaflet, × 1. 5, 7 = *Polystichum lonchitis*; 5 = a portion of a leaf-blade, × ½; 7 = a leaflet, × 1. 6 = *Polystichum Lemmoni*, a primary leaf-division, × 1. 8 = *Polystichum scopulinum*, a primary leaf-division, × 1.

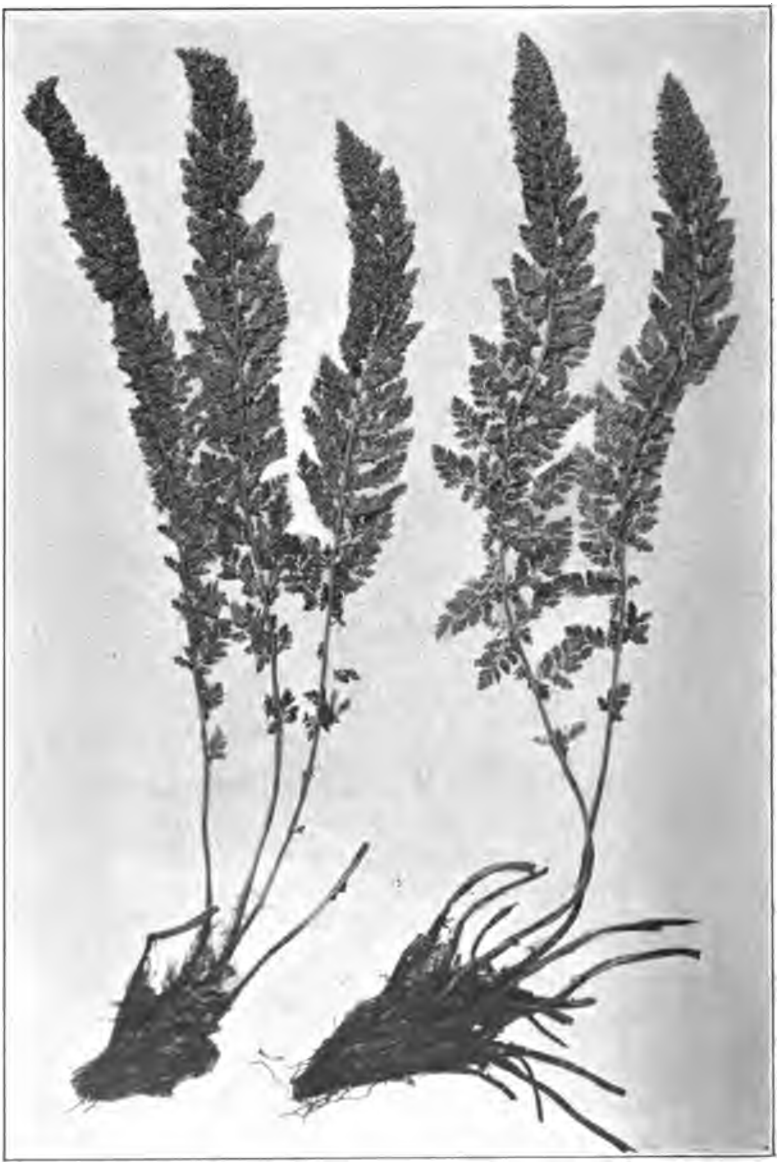

PLATE NO. 14. *Polystichum Lemmoni* × ½.
(Photograph by courtesy Smithsonian Institution)

A family of ferns new to the United States.[1]

WILLIAM R. MAXON

The present note relates to the occurrence of *Dicranopteris flexuosa* (Schrad.) Underw., a member of the family Gleicheniaceae, in the extreme southwestern part of Alabama, as a native inhabitant of that region. A specimen which is perfectly typical of this species was sent to me for identification by Mr. L. H. McNeill, Mobile, Alabama, who wrote that it was "found growing in the 'pine flats', in the south part of Mobile County, in a shallow cut through yellow clay, on the Mobile & Bay Shore R. R. (Alabama Port Extension), about one and one-half miles east of Delchamps Station and across Fowl River." He added, "This plant, the only one I found, was growing in a niche in the perpendicular side of a shallow railroad cut * * and formed a tuft large enough to fill a bushel basket. It grew on the north (the sunny) side of the cut. * * * The road has been built but a few years and, with the exception of rails, no foreign material was used in its construction and practically no foreign material has been carried into that neighborhood."

Mr. McNeill, who has devoted much time to a study of the ferns of southern Alabama, was at pains to include these unusually complete data on acount of his inability to associate the plant with the description of any species known from the southern states and also, apparently, because of the fact that it might conceivably be regarded as an introduction. The chances of its having been introduced by man are, however, very remote. Species of Gleicheniaceae are not in general cultivation, being rather rare even in the conservatories of large botanical institutions; and they are not, as a rule, sufficiently fine or graceful to attract the interest of fern growers. There can be no doubt that this fern was native where collected. We have thus a species, genus, and family added to the known flora of the United States.

---

[1] Published by permission of the Secretary of the Smithsonian Institution.

In response to my request for further information, Mr. McNeill wrote again (July 5, 1913) as follows:

"The date upon which I found the plant was June 15, 1913. It was found on 'Mon Louis Island', which is a piece of land some twenty-five square miles in extent, separated from the mainland by Fowl River, a bayou connecting Mobile Bay and Mississippi Sound. It is 'pine barren' country, traversed by numerous 'gum branches' (small fresh-water streams fed by springs, and usually dry in mid-summer), the south end being deeply indented with areas of salt marsh. It is clay formation and will hardly average more than twenty feet above mean low water."

Dicranopteris flexuosa was originally described from Brazil and has been found to have a wide distribution in tropical America. It is common in the Greater Antilles but less so in the Lesser Antilles. On the continent it has heretofore been known to extend from southern Mexico to Brazil and to occur mainly at low elevations, ascending rarely to 1,500 meters altitude. As to the source of the Alabama specimens it may safely be surmised that they arose from wind-blown spores from Cuba, a hypothesis which explains reasonably the similar occurrence of the many West Indian fern species discovered in peninsular Florida within recent years. It is Mr. McNeill's intention to make a search for additional stations of *D. flexuosa* and it will not be very surprising if he is successful not only in this but in finding also *Blechnum occidentale* and other ubiquitous lowland species not now known to occur in the United States.

It may be mentioned, in passing, that all our American representatives of the family Gleicheniaceae fall under the genus Dicranopteris; Gleichenia itself is exclusively an Old World genus, a fact recognized long ago by Sturm, the capable monographer of this group. But in Dicranopteris, as regarded at present, there are many radically diverse types as to systems of branching, and marked differences also in soriation and in scale structure; so that it is at least worthy of consideration whether Dicranopteris itself ought not to be subdivided into two or more genera, the characters of which would indeed be quite as good as those regarded as distinctive for genera in many other groups. The writer has elsewhere[1] called attention to the need of a critical study of this family.

The synonymy of the single species now reported from Alabama is as follows:

DICRANOPTERIS FLEXUOSA (Schrad.) Underw. Bull Torrey Club **34:** 254. 1907.

Mertensia flexuosa Schrad. Goett. Gel. Anz. **1824:** 863. 1824.

Mertensia rigida Kunze, Linnaea **9:** 16. 1834.

Gleichenia flexuosa Mett. Ann. Lugd. Bat. **1:** 50. 1863.

Gleichenia rigida Bommer & Christ, Bull. Soc. Bot. Belg. **35:** 174. 1896. Not *G. rigida* J. Smith, 1841.

Mr. McNeill's specimen is in the U. S. National Herbarium, being sheet No. 692160.

Some Ferns of Korea

D. F. HIGGINS.

The interests of the American Fern Society may not extend beyond the limits of the United States or of North America, but the writer is risking the sending in of this little preliminary statement in regard to the few ferns of Korea that he has had an opportunity of studying somewhat in detail thus far (July 25th) this year (1913). It is hoped that at a later date a complete description of the species studied, supplemented with sketches, will be sent in to the AMERICAN FERN JOURNAL. It seems to the writer that the Herbarium of the Society might well have for its object the gathering of the complete fern flora of the world for comparative study. Therefore the writer will forward to the Curator of the Herbarium a few suites of specimens such as he has collected sometime before the end of this year. The nomenclature follows Britton and Brown, edition of 1896.

---

[1] Contr. U. S. Nat. Herb. **16:** 52–54. 1912.

The species collected to date are as follows—

1. *Osmunda Claytoniana*, var. (?).

2. *Osmunda* sp.; this species seems to be a transition form between *O. regalis* and *O. cinnamomea.*

3. *Onoclea* sp.; this *Onoclea* resembles *O. sensibilis* but may be a distinct species. As the fertile fronds are not ripe yet a complete study of the form must be made a little later in the season.

4. *Dryopteris* (*Polystichum*) sp.; this form is near *D. Lonchitis* and *D. acrostichoides,* fronds less than one foot long and rooting at the tips to form new plants.

5. *Dryopteris* (*Polystichum*) sp.; this species is near *D. acrostichoides.* The frond is ternately divided, however, and each of the divisions is once pinnate.

6. *Phegopteris Dryopteris,* var. (?); this fern is close to *P. Dryopteris,* but it differs slightly from the form as described in Britton and Brown.

7. *Camptosorus* sp.; Britton and Brown note that there are only two known species of this genus, one in North America and the other in northern Asia. The species observed in Korea is certainly not *Camptosorus rhizophyllus,* so it is very likely the other of the two known

species.[1] Britton and Brown note, however, that *C. rhizophyllus* is "of eastern North America," but the writer has identified it with certainity in abundance on limestone rocks and cliffs in the Ozarks of southern Missouri, along the Meramec River near Bourbon and Sullivan, Missouri.

8. *Asplenium filix-femina;* this fern corresponds exactly to the description given by Britton and Brown.

9. *Polypodium* sp.; a small, evergreen, rock-loving fern with simple entire fronds.

10. *Pteris* sp.; this fern is about the same size as *P. aquilina*, but the frond is 2–4 pinnate, and not ternate.

11. (?); a member of the Polypodiaceae. This is a light green lacy fern 1–2 feet high, frequenting moist places; the sori are on the margins of the fronds; the sporangia develop in the margins and when their pedicels elongate at maturity they push their heads out, splitting open the margins as they come out; when the sporangia are mature the sori look like small black dots on the margins of the fronds. This fern seems to be of a genus not described in Britton and Brown.[2]

Britton and Brown note (vol. 1, p. 8) that there are but three known species of *Onoclea*. They figure and describe *O. sensibilis* and *O. Struthiopteris*. The writer would very much like to have someone send him a description of the third[1] known species[3] of *Onoclea* and the second known species of *Camptosorus* for comparison with the species which occur here. The *Onoclea* which grows here may be only a variety of *O. sensibilis*, but the *Camptosorus* which grows here is distinct from *C. rhizophyllus*. Perhaps this question should be referred to the question and answer department of the JOURNAL.

HOL KOL, KOREA, July 25, 1913.

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[1] [*C. sibiricus* Hooker. Ed.]

[2] [*Trichomanes*, probably. Ed.]

[3] [*O. orientalis* Hooker. Ed.]

Some Fern Reprints Recently Received

R. C. BENEDICT.

Maxon, W. R. A new genus of davallioid ferns. Jour. Washington Acad. Sci., **3**: 143, 144. 4 Mr. 1913.

Maxon describes in this paper, *Sphenomeris,* as a new genus with *Odontosoria clavata* (L.) J. Smith, as its type species. The name *Sphenomeris* is applied to the species formerly in *Odontosoria,* which have leaves with determinate growth. The name *Odontosoria* is applied to the species having climbing leaves of indeterminate growth, like those of *Lygodium.*

Maxon, W. R. Studies of tropical American ferns, No. 4. Contrib. U. S. Nat. Herb. **17**: 133–179. i–x. *fig. 1–7. pl. 1–10.* June 1913.

Under the title "Studies in tropical American ferns," Maxon has already published three papers, comprising two hundred and twelve pages and including about fifty plates besides text figures. These, with the present paper make up a considerable total in this series of valuable data on American ferns which have been developed in connection with the writer's wide studies on the fern phylum.

"The present paper, like the preceding ones of the series, includes brief discussions of several genera or smaller groups of species which have been the subject of great confusion, but which it is now possible to treat with some degree of assurance." The groups treated in the present paper, with the sub-titles, are as follows: *Asplenium Trichomanes* and its American allies; the North American tree ferns of the genus *Dicksonia;* the genus *Odontosoria;* Notes on *Bommeria* and related genera; New species of *Lycopodium;* A new *Cyathea* from Santo Domingo. New species are described as follow: *Asplenium* 4, *Odontosoria* 3, *Lycopodium* 5, *Cyathea* 1, and *Dicksonia* 1.

An interesting fact which may not be known to some of the members of the American Fern Society is the occurrence of *Asplenium platyneuron* in South Africa and elsewhere only in eastern North America. Several instances of such distribution are known.

Christensen, Carl. Two new bipinnatifid species of *Alsophila.* Repert. Nov. Spec. **10:** 213, 214. 1911.

Nephrodium Kuhnii Hieronymus is re-named *Alsophila Kuhnii* by Christensen, because of its basal indusium, of a type common in the tree-fern family, but unknown in *Dryopteris.* It is the smallest "tree-fern" known, being only eight inches long.

Alsophila phalenolepsis is a brand new species from Ecuador of a considerably larger size, (leaves 20–40 inches long), somewhat like *A. phegopteroidea* Hooker.

Christensen, Carl. On the ferns of the Seychelles and the Aldabra group. Trans. Linn. Soc. London. II. **7:** 409–425. *pl. 25.* Dec. 1912.

In this paper, Christensen lists seventy-eight species as the total number known from the Seychelles Islands. As he notes, Baker, in 1877, recognized seventy-four species, and Kuhn in 1879, recognized seventy-six. When it is noted that four of the species in the present papers were collected for the first time in 1908, it will be seen that the lists of Baker and Christensen recognize exactly the same number of species. This fact is of especial interest in view of the opinion sometimes expresses as to the prevalence of species "splitting." According to one view of modern taxonomy, Christensen would have been expected to recognize no fewer than one hundred and fifty species. Naturally the treatment differs from the earlier ones in its nomenclature, that of the Index Filicum being followed in the main.

The Seychelles Islands are extremely interesting owing to their location so far distant both from the Asiatic and

African continents. Of the total number of species listed, twelve are known to occur only on the Seychelles Islands. Two of these are described as new, *Asplenium complanatum*, and *Elaphoglossum Hornei*. Twenty of the seventy-eight occur also in the American tropics. The remaining forty-four are species of Asiatic or African distribution.

Christensen, Carl. A monograph of the genus Dryopteris. Part 1. The tropical American pinnatifid-bipinnatifid species. Kgl. Danske Vid. Selsk. Skr. VII, **10:** 55–282. *fig. 1–46.* 1913.

The paper now under consideration is undoubtedly the most extensive and at the same time most thorough fern monograph ever published. Two hundred and eighty species are treated in its two hundred and thirty odd pages. The results are based on the study of approximately ten thousand specimens, obtained largely by loans from the leading herbaria of Europe and America. The actual significance of these facts will hardly be appreciated except by those who have carried on careful taxonomic research, but it may be noted that the paper under review represents very many laborious hours scattered through a period of years. Its value for fern classification is commensurate with the time and labor involved.

No attempt will be made here to review in detail its findings. Mention may be made, however, of some interesting facts connected with fern distribution. A pronounced difference occurs between the fern flora of Southern Brazil as compared with the West Indian-Andean regions which have much in common. Only fourteen species are found in both regions and even the forms of these which occur in both regions differ somewhat. Three species of the two hundred and eighty occur also in the eastern hemisphere. One of these, *D. eriocaulis*, furnishes another example of American-African distribution, being found only in West Africa and eastern Brazil.

Christensen, Carl. Filices Purdomianae. Bot. Gaz. **56**: 331–338. Oct. 1913.

The article contains a list of sixty-three ferns collected by Mr. Wm. Purdom in the province of Shensi in northern China, in 1910, in connection with the expedition sent out by the Arnold Arboretum. The collection is of especial interest because it includes numerous temperate species, some of which occur also in temperate North America. It is also of especial interest because it undoubtedly includes a number of Chinese species which would grow here with us and add to our lists of hardy ferns for fern gardens.

The following species of our flora occur in the list: *Adiantum pedatum, Asplenium adiantum nigrum, A. Trichomanes, Athyrium acrostichoides, A. filix femina, Cryptogramma Stelleri, Dryopteris Dryopteris* (D. Linnaeana) *D. Phegopteris, Polystichum Braunii, Lycopodium annotinum.*

Apparently the collecting trip extended into tropical as well as temperate regions, since the list includes a considerable proportion of tropical species. Six new species are described and a number of other species listed as new to the region or otherwise noteworthy. The new species are distributed as follows: *Athyrium, Cheilanthes, Dryopteris* (*2*), *Matteuccia,* and *Polystichum.* The Matteuccia is described as intermediate between *M. Struthiopteris* and *M. orientalis.*

Tidestrom, Ivar. Botrychium virginianum and its forms. United States National Museum **16**: 299–303. *pl. 102.* 29 Dec. 1913.

The writer discusses the variations of *Botrychium virginianum* in its broadest sense and concludes that two species should be recognized instead of one, the second species to be assigned the name *B. cicutarium* (Sar.) Swartz. To this latter species he assigns as synonyms *B. dichronum* Underwood, *B. brachystachys* Kunze, and *B. virginianum v. mexicanum* Hooker.

B. cicutarium he distinguishes from *B. virginianum* on the basis of the persistent leaves which last more than one season, and the comparatively shorter fertile portion. *B. cicutarium,* as recognized, is native in the West Indies and Central America. Typical *B. virginianum* ranges as far south as the State of Hidalgo, Mexico.

HIGH SCHOOL OF COMMERCE,
120 W. 46TH ST., NEW YORK CITY.

Notes and News

CONCERNING THE PERSERVATION OF NEW FORMS OF FERNS

I find in the January issue of the AMERICAN FERN JOURNAL a reference to a "belated maidenhair" (*A. pedatum*) which is of interest, as it may imply a *sempervivum* form of that species well worth cultivation if the plant had been collected for cultivation instead of, as is too often the case, destroyed by collectors for mere herbarium purposes. In fact the final remark "how much longer it might have survived" rather indicates another instance of botanical vandalism. A parallel case, with one material difference, exists in the case of the deciduous *Cystopteris fragilis,* of which a perfectly green plant was discovered in the Highlands of Scotland some years ago in the winter. The plant was lifted and grown and eventually a fertile frond was sent to me, from which I raised a large number of very robust plants, which proved to be not merely "*sempervirens*" or evergreen, but practically "*sempercrescens,*" since they grew all the year round, while the species

(*C. fragilis*) dies down early in the autumn. In my conservatory which is quite cold and in which all plants are frozen in the winter, I have a pot of this fern, now in April, which still carries last year's fronds in a quite green and living condition. This is all due to the fern falling into the hands of a true fern lover instead of a botanist whose only thought is of his cherished graveyard, the herbarium, for which a frond or two at the time would have sufficed, while the precious roots would, if properly treated, have supplied him and his friends with an indefinite supply later on if treated discreetly I remember another kindred case some years ago, also in the United States, where a collector proudly recorded a new find of which he took all the first crop of fronds in the early summer and then gave a friend the "tip," who went in the autumn and gathered the second one, almost inevitably killing the root outright. I should not like to see such a "triumph" debited to my name. Quite possibly the *A. pedatum* in question would have gifted the horticultural world with an evergreen form of that delightful fern, especially since so many of its kindred, unlike *Cystopteris* are evergreen.

CHAS. T. DRUERY.

CHAS. T. DRUERY

In a recent issue of "Garden Life," a London weekly devoted to horticulture, appears a brief sketch of the life of Chas. T. Druery. It is an interesting account of the scientific and literary achievements of this enthusiastic student and grower of ferns. Members of the Fern Society will be interested to know that Mr. Druery was one of the first to receive the Victorian Gold Medal of Honor in Horticulture, and that he is the author of two volumes of verse and several humorous works besides his well known books on British Ferns. The article is illustrated with a portrait of Mr. Druery and pictures of some products of his skill in fern culture.

In this connection the note appearing on another page will be of especial interest. It was sent as a letter to Mr. Winslow.

AN UNUSUAL STATION FOR BOTRYCHIUM LANCEOLATUM

On the 2d of last July Mr. C. H. Bissell, Mr. C. A. Weatherby and the writer explored a gorge on the farm of Mr. Homer J. Heath, in the northern part of the township of Newfane, Vt. In the woods above the gorge we found a remarkable growth of *Botrychium lanceolatum*. During the half-hour or so that we were traversing this piece of woods we came upon groups of from three to twenty plants every few steps. There must have been thousands of them. *Botrychium ramosum* was also present, but in smaller number.

The writer has seen this plant growing in several localities in western Connecticut and Massachusetts, and eastern and northern Vermont, but always in rather moist rich woods, and often in quite swampy ground. The Newfane station is a rather dry and very steep wooded hillside with a northeasterly slope and an elevation, according to estimates furnished by Mr. L. A. Wheeler, of Townshend, Vt., of about 800 feet above sea level and more than 200 feet above the neighboring river.

AUBURNDALE, MASS. E. J. WINSLOW.

A CORRECTION

In the interests of accuracy, permit me to call your attention to an erroneous statement in your April number. Mr. James A. Bates writes: "I think it was Clute who made the mistake in an early Bulletin of calling Dicksonia the fragrant fern." If Mr. Bates will consult Fern Bulletin, Volume 4, page 48, and the same publication Volume 5, page 15, he will discover that Dicksonia was mistaken for the fragrant fern but not by Clute. The man who made the mistake and who listed the Dicksonia under the name of a rarer fern in a well known State flora was a much more prominent botanist. It was Clute who first pointed out the error. We have always been taught that New Englanders are committed to plain living and high thinking, but it is apparent that the last mentioned process sometimes slips a cog. The matter of the Dicksonia is not of much consequence, yet we feel that we ought to stop this careless kind of thinking at the outset; otherwise, some other misguided fern student may inform the public that he thinks that Clute was the first one to mistake carrots for ferns. Up to the present, however, we have been able to prove an alibi; in fact we have laid in quite a stock of alibis in anticipation of having use for them when the thinking in New England gets to running smoothly.

WILLARD N. CLUTE.

HYBRIDS IN EQUISETUM?

In an article entitled "Anatomy as a means of diagnosis of spontaneous plant hybrids" (Science, N. S. 38: 932, 26 Dec 1913), Miss Ruth Holden discusses evidence indicating that plants may be hybrids without showing intermediate external characters. In such cases a study of their anatomy will serve to reveal their real relationships.

For example, a birch growing at the Arnold Arboretum which had been identified as *Betula pumila* was found to possess wood characters entirely different from those of *B. pumila* together with peculiarities of stamen structure with nearly abortive pollen. These facts, together with the fact that the tree in question was one of a group of seedling birches, several of which had shown also external evidences of hybridity, were taken to indicate a hybrid origin for this tree also.

Equisetum littorale has been long suspected in Europe and America to be a hybrid between *E. arvense* and *E. limosum* on the basis of external and internal characters. Similarly material of *E. variegatum Jessupi*, collected on Toronto Island by E. C. Jeffrey, was found to possess peculiar internal characters indicative of hybridism between *E. variegatum* and *E. hyemale*.

The writer of the article is gathering facts about other so-called "varieties" of *Equisetum*, and would undoubtedly be glad to receive material of this sort from different parts of the country. Such material may be sent care of Harvard University.

R. C. B.

$30,000 PAID FERN PICKERS

More than $30,000 has been paid out in the months of September, October and the first part of November to gatherers of wild ferns in the four Bennington county towns of Woodford, Stamford, Searsburg and Readsboro. The pickers were paid by the piece, four cents a hundred, and as there have been more than 6,000,000 ferns shipped out of the mountains this season, the sum total is easily reached.

The industry is comparatively new and was brought about by the discovery of the florists that the addition of a few ferns as a background for a box of blossom added materially to the value of the purchase in the eyes of a customer, especially in winter. Since it became known that the ferns could be kept all winter in cold storage the business of gathering and retailing has increased rapidly until there are at present many firms in New York and Massachusetts which give it their entire attention.

After the slopes of the Taconic mountains, which run through the southeastern half of Bennington county, were stripped of their evergreen timber the original growth was followed by a forest of hard wood and with it came the ferns, which in many sections completely covered the ground. Only two varieties are used by the greenhouses, the hardy rock and serrated ferns, for the reason that they are tough and capable of withstanding rough handling to which they are subjected during the picking and shipping.

The pickers are paid four cents a hundred for ferns tied in bunches of 25. Some of the experts have earned at that rate between $7 and $8 in a single day. In the last two years the industry has grown to such an extent that the lumber companies which control the mountain land on which the ferns are gathered now lease the picking privileges, instead of permitting free access to the property, as was formerly the case.

The business is rather precarious. Some years the ferns keep well in cold storage and at $2.50 a thousand, the price charged the florists, good profits are made. Not infrequently, however, there are heavy losses. The ferns, for some reason that has not yet been discovered, turn black or yellow and become worthless.

[From a newspaper clipping]

American Fern Society

The recently appointed Treasurer asks all members to remit dues for the current year as promptly as possible. Following a new policy bills will be sent out with the JOURNAL. Members in arrears for 1913 will confer a favor by cancelling their obligation at once and thus obviate the necessity of having their names stricken from the waiting list. The Treasurer asks each of you to be lenient for a time and call attention promptly to mistakes that may occur. He also earnestly requests every member when sending in dues to send his *full name*, first name, middle name, and last name written very plainly with the correct address that he may revise his list of members.

Attention is called to our constitution, which contains the following:

"Article 3, Section 6. No member in arrears for dues shall vote, hold office, or receive the publications of the Society."

The Executive Council is endeavoring to live up to the rules; if you wish to receive the JOURNAL please see that your dues are paid promptly to Treasurer Floyd.

Since the manuscript for the Annual Report was prepared several additions to the Society Herbarium have been made. Dr. O. E. Jennings has given 15 sheets from Ontario in addition to those previously noted. Prof. H. H. Tracy has donated 23 sheets of California specimens, and Miss Laura F. Kimball 3.

Prof. Tracy's contribution contained five species which are rather rare as well as being new to the Herbarium, viz., *Polystichum californicum* (Eat.) Diels., Diels., *Polystichum Lemmoni* Underw., *Botrychium silaifolium* Pr., *Dryopteris oregana* C. Chr. (*D. nevadencis* Underw.), and *Pellaea brachyptera* (Moore) Baker. Miss Kimball added the very rare *Ophioglossum californicum* Prantl. These have all been mounted and catalogued, making the total number of sheets now in the Herbarium 1263.

L. S. HOPKINS.

LIST OF MEMBERS BY STATES

Alabama	2
Arkansas	0
Arizona	1
California	8
Colorado	0
Connecticut	10
Delaware	0
Dist. of Columbia	15
Florida	4
Georgia	0
Idaho	0
Illinois	6
Indiana	3
Iowa	3
Kansas	0
Kentucky	0
Louisiana	1
Maine	7
Maryland	2
Massachusetts	37
Michigan	2
Minnesota	3
Mississippi	0
Missouri	8
Montana	0
Nebraska	2
Nevada	0
New Hampshire	4
New Jersey	5
New Mexico	0
New York	56
North Carolina	1
North Dakota	1
Ohio	5
Oklahoma	0
Oregon	0
Pennsylvania	19
Rhode Island	0
South Carolina	1
South Dakota	0
Tennessee	0
Texas	1
Utah	0
Vermont	13
Virginia	2
Washington	2
West Virginia	0
Wisconsin	0
Wyoming	0

This list, showing the location of our membership, is given to call the especial attention of all members to the fact that there are large sections of our country, some of which are of great interest to fern-lovers, where our Society is very feebly or not at all represented. There are fern students in all these districts, only we are not in touch with them.

Will not each member, on receiving this report, look over the above list carefully, try to remember some friend or acquaintance not a member, who is interested in ferns, and then write to such person asking them to join our Society, and at the same time notify our managing editor, Mr. E. J. Winslow, that you have done so?

In order to make our Fern Journal as good as we wish we should have a larger membership. If each member will find a friend to join us we shall be benefited as a Society, not only by the increased revenue, but also by an additional interest in the work of our Society.

C. H. BISSELL, *Pres.*

While attending the annual meeting of the American Association for the Advancement of Science, held at Atlanta about the first of the year, the editor took opportunity to make several collecting trips into the surrounding country on the lookout for ferns. *Asplenium montanum*, *Cheilanthes tomentosa*, *Asplenium Bradleyi*, and *Polypodium polypodioides* were perhaps the most interesting ferns found. A few duplicates of these were collected and may be had for the postage as long as they last.

It has been suggested that a field trip for members of the Fern Society be scheduled in the neighborhood of New York next summer. No definite locality has been named as yet, the question being one to be determined by the preferences of those making the trip. The limestone regions in Central New York about Syracuse are of especial interest not only because of their many ferns, including *Phyllitis*, but also because of beautiful and interesting geological formations. The neighborhood about New York City has interest for fern students principally because of frequent swamps, usually good hunting places for fern hybrids. *Dryopteris simulata* is within easy access, and *Schizaea* could be reached by a day's trip. The Catskill and the Lake George region offer the chance of finding *Polystichum Braunii*, as Mr. Burnham tells on another page. Let the editor hear about any other locality which ought to be considered, but let him particularly have the names of those who wish to be considered as probable attendants at such a field trip, with a statement as to preference as to locality and date best suited.

Incidentally cannot members in other parts of the country arrange for similar trips in their territory? The pages of the JOURNAL are open for preliminary notices of such meetings. There is no better way to learn about ferns than to get with other people interested in them.

American Fern Journal

A LOOK AHEAD.

During the year 1913, the Journal comprised 128 pages, together with nine full page plates and twelve text figures of varying size. The cost of these illustrations was met mainly by extra contributions from friends of the Journal who were interested to demonstrate what could be done with more ample funds than were available from the regular Society dues and subscriptions. If our income had been larger, we could easily have published one hundred and sixty pages with double the number of illustrations. There is now no dearth of copy.

It is worth while now to give some consideration to ways and means for 1914. The extra contributions during 1913 amounted to over fifty dollars. It may be noted that there is no certainty, or even probability, of so large an amount during the coming year.

What sort of a Journal do the members desire for 1914? If it is to be equal in size and amount of illustrations to that of this year, sufficient financial provision must be made for it, either (1) by a considerable increase in the number of members, or (2) by extra contributions, or (3) by an increase in the membership and subscription prices. The Society officers would welcome expressions of opinion from as many members as possible.

Again, as regards the contents of the Journal, the editors will print what you want, *if you send it in.* If you wish a different filling than that of the past year, send it in.

ANNUAL REPORT OF THE AMERICAN SOCIETY

Report of the President

Evidence is not lacking of vigor of interest and activity in our membership. Indeed, I am convinced that this Society is possessed of a vitality which promises well for the future. Our members are individually interested in some phase of fern study or observation, many of them keenly, actively, and fruitfully. Doubtless it remains for many of us to discover the advantages which may be given or received through an association of more than a quarter of a thousand men and women scattered over our own and other countries, and I believe that we would do well in developing the fraternal spirit to a greater degree. At another time* I took occasion to offer some suggestions which, if acted upon, would in my opinion render membership more enjoyable and profitable. I venture to hope that those suggestions may still have value.

Doubtless, the most tangible evidence of the Society's activity is to be found in its JOURNAL. This evidence is very real, and is a good demonstration of what can be done when there are those who are sufficiently interested and competent to put themselves to a specific task. The present arrangement providing for a "Business Manager" seems as effective as it is desirable. We are fortunate in having among our members those who, in addition to already exacting demands upon them, are willing to devote the necessary time and energy to the production of a periodical which so creditably reflects what the Society stands for. These gentlemen merit the commendation and co-operation which

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* AMERICAN FERN JOURNAL, April 1912, p. 58.

I am confident we all desire to give them. I believe that to them should also be given the greatest freedom in the handling of their work. More perhaps than anyone else they are in position to know the resources of the Society and to feel the responsibility of adjusting the expense to the income, and it should therefore be very largely left to them to determine the details of JOURNAL management.

It is gratifying to learn that there is no lack of material for publication. If we sometimes wish that the JOURNAL contained more in the nature of brief comment and personal, every day observation and experience from our members at large, we must remind ourselves that we are responsible for such lack and not the editors, who invite and welcome contributions of that character. I believe that the JOURNAL might well be made the medium of greater interchange and expression among members.

There are several points of organization and administration which invite attention and possible action. Among these are the proposed revision of the Constitution, and the question as to what course to pursue with reference to members in arrears for dues. Of the first it may be said that a committee was appointed by Dr. Dowell, who was then President, for the purpose of considering and reporting upon the matter. It seems desirable that certain points which have led to differences of interpretation should be cleared, that others looking to better form should be modified and possibly that some changes be made in methods of procedure. This committee has given the matter some consideration and expects to present its report in the near future.

The other point suggested above may be covered in the treatment of the first. The question arises as to how long one's name should be carried on the membership list after he fails to pay his dues. Clearly the expense of mailing notices and sending the JOURNAL should not be continued indefinitely if the member in question, after the lapse of several years and after having the matter brought to his attention, fails to give any expression indicative of his desire to receive them. This has been a matter of some concern to our Treasurer and his official associates.

In view of the approaching Exposition in San Francisco in 1915 it may not be inopportune to suggest the possibility of getting together such of our members as shall be in that city at that time. If some of our western members would take this matter in hand agreeable results would surely follow.

While we have a gratifying and increasing number of members, this number might be materially augmented if present members would more generally extend their personal invitation to those known to be interested in the subject. It may be noted that there are some states which are wholly unrepresented in our membership list. I suggest that some systematic effort be made toward securing members from such unrepresented states.

But after all, a large membership and a well-equipped organization are of value only as they are made use of for the promotion of the delightful study in which we are engaged. It is to be hoped that the coming year will see a distinct increase in the use made of the means at hand.

ROBERT A. WARE.

BOSTON, DECEMBER, 1913.

Report of the Secretary for 1913

The American Fern Society is now enjoying the most prosperous period of its existence. The membership is increasing rapidly and the FERN JOURNAL has been conducted in such a manner that it has won merited praise wherever the publication is known. Meanwhile the herbarium has not fallen behind—in fact the number of mounted sheets has been more than doubled within the last four or five years.

The various officers have worked together in harmony and the year has been a very pleasant one to those who have been charged with the duty of carrying on the business affairs of the Society.

The writer believes the best interests of the Society would be furthered by combining the offices of secretary and treasurer with title of secretary-treasurer. It would save much time and no little postage. The latter item is considerable since all the business of Society must be conducted by correspondence. It also takes considerable time to learn how to carry on the business of the Society with the least effort and expense and the Society would profit by not changing its officials too often.

The Society now has 242 members, the largest number by far in its history. A little well directed effort would no doubt increase this number considerably.

Although re-elected, the writer has resigned, as it is impossible to find the necessary time to devote to the office. It is the intention also to devote more time to building up the herbarium.

Let us all co-operate with the new officials to make the new year better in every way than any that has preceded it.

L. S. HOPKINS,
Secretary.

KENT STATE NORMAL SCHOOL,
KENT, OHIO.

Report of the Treasurer

Jan. 1–Dec. 31, 1913

RECEIVED		
Balance on hand Jan. 1, 1913		$ 2.29
Received from dues, subscriptions, and sale of back numbers		250.40
Gifts from H. E. Ransier ($16.99), R. C. Benedict ($5.00), E. J. Winslow ($5.85), and T. C. Frye ($25.00) (Used largely for engraving plates, a few of which are to appear in 1914.)		52.84
Received from advertisement		4.00
DISBURSED		
Postage and envelopes used by Treasurer for bills and receipts	$ 12.54	
Printing receipt forms	2.25	
Engraving plates	56.45	
Printing four numbers of Journal and Annual Report	206.65	
Expenses incurred by business manager: envelopes, express, postage for mailing Journals, etc.	15.56	
Cards for elections, and printing same	4.16	
Balance on hand December 31, 1913	11.92	
	$309.53	$309.53

HAROLD GODDARD RUGG,

HANOVER, N. H.

Report of the Judge of Elections

TO THE SECRETARY OF THE AMERICAN FERN SOCIETY:

The undersigned, Judge of Elections by appointment of Pres. Robert A. Ware, respectfully presents the following report of the balloting for officers of the American Fern for 1914:

Whole number of ballots cast	62
Number of complete ballot'	59
Number of incomplete ballots	3
Necessary for choice	32

For President.

Mr. C. H. Bissell	45
Mr. William Palmer	14
Mr. H. E. Ransier	1
Mr. Edwin C. Jellett	1
	—
	61

For Vice-president.

Miss Nellie Mirick	47
Mr. Geo. L. Moxley	13
Dr. S. M. Newman	1
	—
	61

For Secretary.

Mr. L. S. Hopkins	49
Mr. F. T. Pember	11
Mr. Clayton S. Wertsner	1
	—
	61

For Treasurer.

Mr. H. C. Bigelow	31
Mr. F. G. Floyd	28
Mr. George Redles	1
	—
	60

I therefore declare the election of Mr. C. H. Bissell as President; Miss Nellie Mirick, Vice President; Mr. L. S. Hopkins, Secretary; of the American Fern Society for 1914.

Thirty-two votes being necessary for election, there has been no election of the Treasurer.

DORA A. RADLO.

NORTH ADAMS, MASS., NOVEMBER 1, 1913.

Report of the Curator

The Herbarium is growing rapidly and now numbers 1,223 mounted sheets, as compared with 553 sheets when it was turned over to the present curator a few years ago.

In addition to the donations previously acknowledged through the JOURNAL, Mr. F. T. Pember, of Granville, N. Y., just recently sent in 68 mounted sheets. Miss Nellie Mirick, of Oneida, N. Y., also contributed 22 mounted sheets at the same time. Mr. Pember's collection included native species only, while Miss Mirick's collection contained several European species. Each contribution contained some very desirable specimens.

There is a growing tendency manifested in many places to cultivate the native ferns as well as collect them. This is as it should be. It preserves the native species, affords an opportunity to study critical forms, and allows others the privilege of enjoying their beauty.

During the year four persons have availed themselves of the opportunity to borrow specimens from the Society Herbarium for comparison and study. The Herbarium contains some fine material, and members should bear in mind that they may borrow it merely by paying the postage.

L. S. HOPKINS,
Curator.

KENT STATE NORMAL SCHOOL,
KENT, OHIO.

(Continued from page 32.)

Names to be added to the list of members: Mrs. A. E. Marsh, The Rectory, Blair, Neb.; Wilhelm Nikolaus Suksdorf, Bingen, Washington; Leston A. Wheeler, Townshend, Vt.

In addition to another installment of Prof. Frye's fern flora of Washington, the next number of the JOURNAL will contain among other things a study of the ferns of a section of Maine, a fern flora of South Carolina, a list of California ferns collected in a small area, a description of the habitat requirements of *Ophioglossum Engelmanni*, besides a number of short notes. The items listed will probably more than fill the space of an ordinary number. The only reason why the JOURNAL will not have more articles will be the necessity of keeping within our income, and limiting each number to no more than 32 pages.

American Fern Journal

Vol. 4 APRIL-JUNE, 1914 No. 2

The Ferns of Washington

T. C. FRYE AND MABEL McMURRY JACKSON

(Concluded from AMERICAN FERN JOURNAL, Vol. 4, No. 1, page 13, January-March 1914.)

6. ATHYRIUM.

Plants tall. Leaves herbaceous; petioles green or greenish, not filiform, the bundles concentric and uniting above into a 3–4-armed central bundle; scales delicate, of thin-walled cells. (Greek *a* = not, *thyreos* = a large oblong shield; apparently referring to the indusium.) We have only the following species.

1. **ATHYRIUM CYCLOSORUM** Rupr. (Plate 15. Plate 16, f. 1, 2.

Swamp Fern.

Leaves 1–6 feet high, tufted; petiole short, stout; blade narrow at base, thin and delicate when growing in shade but coarser when in sun, narrowly ovate, acute, 2=pinnate; leaflets divided nearly to mid-vein, the margin serrate. Sori small, curved, forming more or less of a complete circle, on free veins, about half-way between mid-vein and margin; indusium membranous, opening along outer margin.—Alaska to Nebraska and Oregon.

7. ASPLENIUM. SPLEEN-WORT.

Plant small. Leaves evergreen, 1-pinnate; blade linear; leaflets regular in size except at very tip, oval or ovate; veins free; petiole filiform, the bundles either

[No. 1 of the JOURNAL (4: 1–40) was issued Mar. 30, 1914]

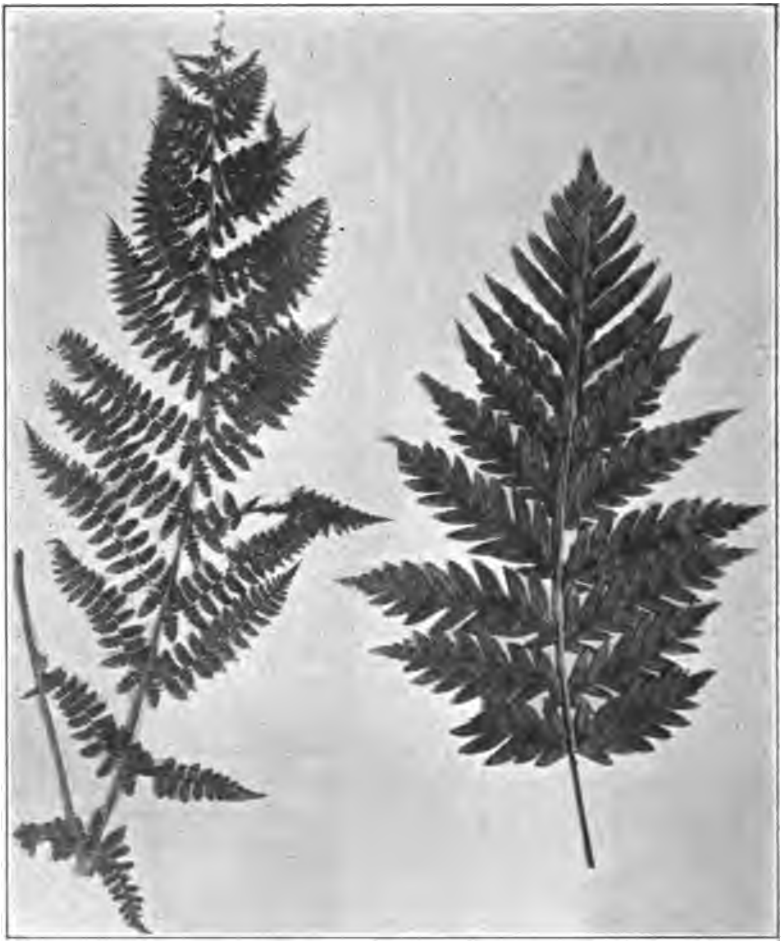

PLATE NO. 15.
Left = *Athyrium cyclosorum*, × ¼. Right = *Woodwardia spinulosa*, × ⅓.

separate and peripheral or united upward forming a lunate bundle. Sori oblong or linear, oblique to mid-vein, separate; indusium straight, opening toward mid-vein. (Greek *a* = taking away, *splen* = spleen; some were formerly supposed of value in spleen diseases.)

A. Petiole purple to brown, shining, round; leaflets 12–36 pairs, oval; margin crenate. 1. *A. trichomanes.*
AA. Petiole green, dull, flat; leaflets 6–20 pairs, ovate or rhomboidal; margin deeply crenate. 2. *A. viride.*

1. ASPLENIUM TRICHOMANES L. (Plate 16, f. 10, 11.)

Leaves 3–12 inches long, densely tufted; petioles purple to brown, shining, short; leaflets 12–36 pairs, nearly opposite, oval, the two sides often unequal, wedge-shaped or truncate at base, margin crenate.—Alaska to Nova Scotia, south to Arizona, Texas and Alabama.

2. ASPLENIUM VIRIDE Huds. (Plate 16, f. 8, 9.)

Leaves 2–4 inches long, thinly tufted; petioles flat and green except at base, often as long as blade; leaflets 6–20 pairs, ovate to rhomboidal in outline, upper edge narrowed suddenly at base, lower narrowed gradually, margin deeply crenate.—Alaska to Oregon, Colorado and Vermont; Europe; Asia.

8. LOMARIA.

Tufted; rhizomes erect. Sterile leaves shorter than the fertile and distinctly different; both kinds 1-pinnate (ours) or 2-pinnate; petiole not twisted. Sori parallel to the mid-vein of the leaflet, often covering almost the whole under side of the blade. (Greek *loma* = a border, probably referring to the indusium.) We have only the following species.

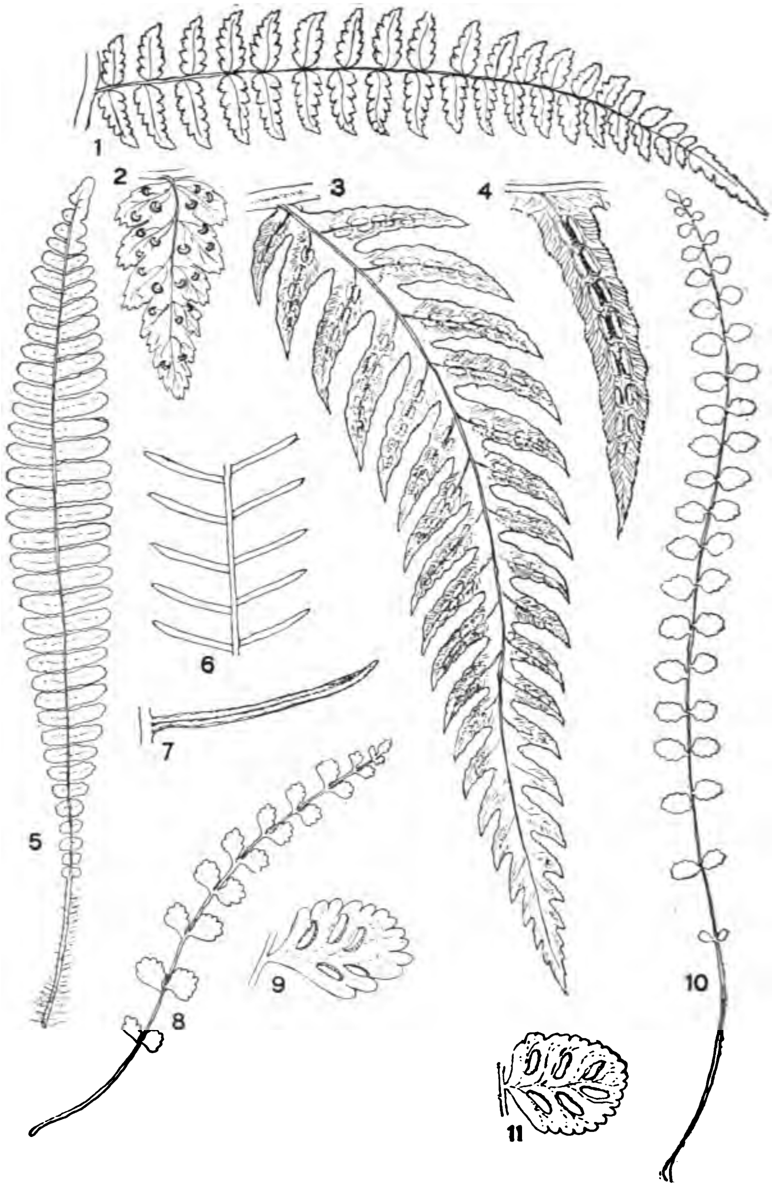

PLATE NO. 16.

1, 2 = *Athyrium cyclosorum;* 1 = a primary leaf-division, × ½; 2 = a leaflet, × 1½. 3, 4 = *Woodwardia spinulosa;* 3 = a primary leaf-division, × ½; 4 = a leaflet or leaf-lobe, × 1. 5, 6, 7 = *Lomaria spicant;* 5 = sterile leaf, × 1/6; 6 = a portion of the blade of a fertile leaf, × ½; 7 = a fertile leaflet, × ½. 8, 9 = *Asplenium viride;* 8 = a leaf, × ½; 9 = a leaflet, × 2. 10, 11 = *Asplenium trichomanis;* 10 = a leaf, × ½; 11 = a leaflet, × 2.

1. **LOMARIA SPICANT** (L.) Desv. (Plate 16, f. 5, 6, 7.)

Deer-Fern.

(*Struthiopteris spicant* Weiss; *Blechnum spicant* Sm.)

Leaves tufted, of two kinds, fertile longer than sterile; petiole of sterile leaf comparatively short; its blade 1-pinnate or pinnately lobed, coriaceous, linear to lanceolate, 8–24 inches long; leaflets oblique to mid-vein. Petiole of fertile leaves long; leaflets of fertile leaves narrower than sterile ones. Sori in a continuous band next to mid-vein of fertile leaflet, covered until mature by thin membranous indusium.—Alaska to California; Europe; Asia.—Often grown in houses for decorative purposes, because it withstands well the dry air and the shade of such a habitat. Eaten by deer in the spring.

9. WOODWARDIA. CHAIN FERN.

Plants large. Sori oblong to linear, in a chain-like row on each side of the mid-veins of the lobes of the leaflets; indusium fastened by its outer margin, inner side free and open. (Honor of T. J. Woodward, an English botanist.) We have only the following species.

1. **WOODWARDIA SPINULOSA** Mart. & Gal. (Plate 15, f. 2. Plate 16, f. 3, 4.)

Leaves 3–6 feet high; petiole long, stout; blade subcoriaceous, oblong to ovate, 1–pinnate; leaflets divided nearly to mid-vein, acute; their lobes wavy at margin, edged with fine spines; veins free from depressions to margin. Sori placed in little depressions formed between and by the veins; indusium convex.—British Columbia to California, Arizona and Mexico.

10. CEROPTERIS.

Leaves tufted. Sori along the veins, elongated; indusium none. (Greek *kera* = wax, *pteris* = fern; the back of the leaf is covered with a yellowish wax-like powder.) We have only the following species.

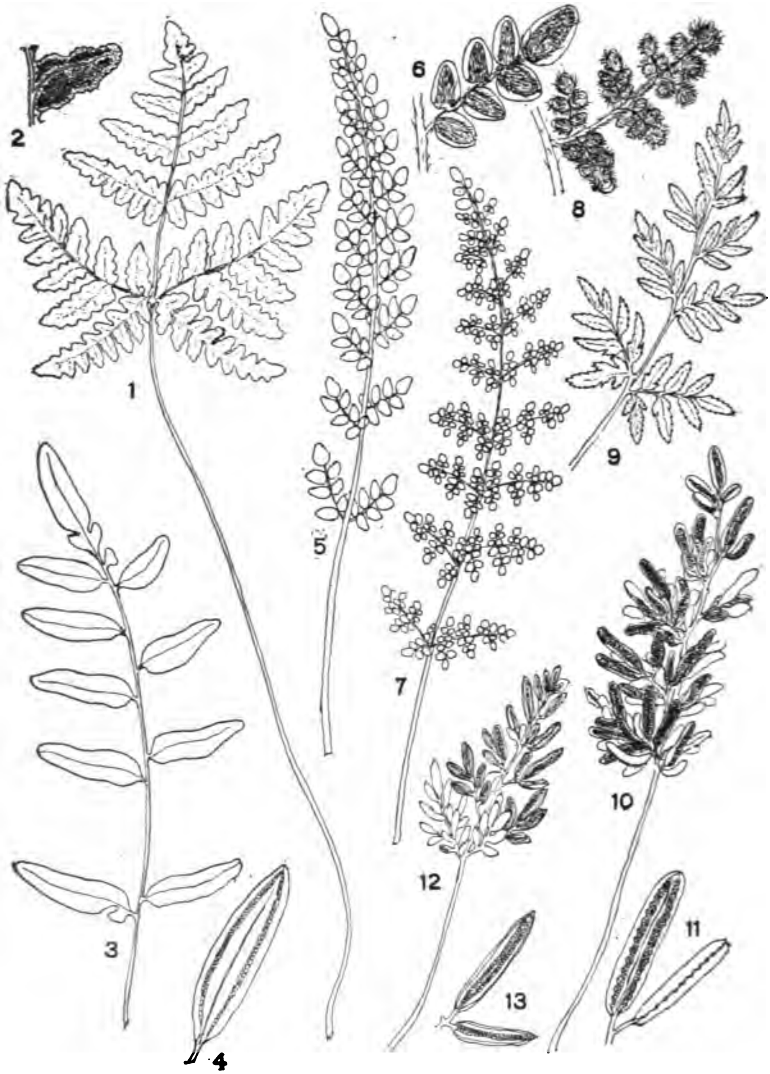

PLATE NO. 17.

1, 2 = *Ceropteris triangularis;* 1 = a leaf, × ½; 2 = a leaflet or leaf-lobe, × 1. 3, 4 = *Pellaea occidentalis;* 3 = a leaf, × ½; 4 = the under side of a fertile leaflet, × 1. 5, 6 = *Cheilanthes gracillima;* 5 = a leaf, × 1; 6 = a primary leaf-division, × 2. 7, 8 = *Cheilanthes Feei;* 7 = a leaf, × 1; 8 = a primary leaf-division, × 2. 9, 10, 11 = *Cryptogramma acrostichoides;* 9 = a sterile leaf, × ½; 10 = a fertile leaf, × ½; 11 = two fertile leaflets, under side, × 1. 12, 13 = *Cryptogramma densa;* 12 = a leaf, × ½; 13 = two fertile leaflets, under side, × 1.

1. **CEROPTERIS TRIANGULARIS** (Kaulf.) Under. (Plate 17, f. 1, 2.)

Gold-back Fern.

(*Neurogramma triangularis* Deils; *Gymnopteris triangularis* Underw.)

Petiole 6–15 inches long, glossy, black; blade triangular to pentagonal, 1–5 inches long, nearly as broad as long, 3-pinnate; lower surface coated with a yellow to white waxy powder; lower pair of primary leaf-segments largest, triangular; segments rounded to obtuse at tip, crenulate. Sori nearly covering under surface. —On dry rocky slopes. British Columbia to California and Arizona.

11. PELLAEA.

Rock-ferns, small, tufted. Leaves 1–3-pinnate (1 in ours); petiole slender, brown, shining; leaflets of spore-bearing leaves narrower than those of the others but otherwise similar. Sori marginal, covered by the reflexed leaf-margin. Veins clearly visible in ours. (Greek *pellos* = dark; referring to the petiole.) We have only the following species.

1. **PELLAEA OCCIDENTALIS** (Nels.) Rydb. (Plate 17, f. 3, 4.)

Rootstock densely covered with rusty hair-like scales. Petioles glabrous; blades 1½–4 inches long, oblong, 1-pinnate; leaflets 2–6 pairs, not crowded, oblong, mostly obtuse, dark-green, shining, firm and somewhat coriaceous, entire or the lower ones with one or two lobes at the base; veins clearly visible. Indusium wide, wholly covering sori.—South Dakota to Wyoming and Washington.

12. CHEILANTHES. LIP FERN.

Small, tufted, rock-ferns. Leaves olive-green, 2–3-pinnate, more or less hairy; terminal leaflets the largest, veins free. Sori usually continuous on terminal veins, marginal; indusium formed from reflexed margin of leaf, roundish. (Greek *cheilos* = margin, *anthos* = flower; because the sori are marginal.)

A. Leaves 2-pinnate, lower surface densely covered with short hairs.
1. *C. gracillima.*
AA. Leaves 3-pinnate, lower surface covered with long woolly hairs.
2. *C. feei.*

1. CHEILANTHES GRACILLIMA Eat. (Pl. 17, f. 5, 6.)

Lace Fern.

Petioles 2–5 inches long, brown, shining, slightly hairy; leaf-blades lanceolate, 2-pinnate, 1–4 inches long; leaflets entire; under surface densely covered with short brown hairs.—British Columbia to Idaho and California.

2. CHEILANTHES FEEI Moore. (Pl. 17, f. 7, 8.)

Petioles 1–3 inches long, dark-brown, shiny, more or less hairy; leaf-blades ovate to lanceolate, 3-pinnate, 1–3 inches long, under surface densely covered with long woolly brown hairs.—British Columbia to Illinois, south to Arizona and Texas.

13. CRYPTOGRAMMA. ROCK BRAKE.

Plants low. Leaves tufted, smooth, 2–3-pinnate, the fertile somewhat unlike the sterile; petioles of the fertile ones longer than those of the sterile, and the leaf-divisions much narrower. Sori roundish or oblong, at or near the ends of free veins, covered by reflexed leaf-margin when young but almost free when mature. (Greek *cryptos* = hidden, *gramma* = a line; because the line of sporangia is at first hidden by the leaf-margin.)

A. Sterile leaflets obtuse, ovate-oblong; indusium not scarious.
1. *C. acrostichoides.*
AA. Sterile leaflets very acute, linear-lanceolate; indusium scarious.
2. *C. densa.*

1. **CRYPTOGRAMMA ACROSTICHOIDES** R. Br. (Pl. 17, f. 9, 10, 11.)

Leaves light-green; blades 2–3-pinnate; sterile blades ovate to ovate-lanceolate, decidedly leaf-like, blade 1–4 inches long; leaflets of sterile leaves ovate, twice as long as wide, toothed or incised; leaflets of fertile leaves crowded, narrowly elliptical, 3–6 times as long as wide. Sori confluent at maturity, covering back of fertile leaflets.—Alaska to Great Lakes, Colorado and California.

2. **CRYPTOGRAMMA DENSA** (Brack.) Diels. (Pl. 17, f. 12 13.)

(*Pellaea densa* Hook.)

Petioles wiry, 3–9 inches long, blades closely 3-pinnate, 1–2 inches long, ovate, coriaceous; segments linear, ⅛–⅜ inch long, nearly sessile, pointed or mucronate; fertile segments entire, margin recurved, bearing a membranous indusium on edge; sterile segments sharply serrate.—British Columbia to Wyoming and California.

14. ADIANTUM. MAIDEN-HAIR FERN.

Petioles black or dark brown, shining; leaflets with chief vein at lower margin, or none (ours). Sori marginal, borne on the under side of the inrolled leaf margin on the tips of free forking veins, oblong. (Greek *a* = not, *diaino* = to moisten; because the leaves shed water without getting wet.) Sometimes grown as a house plant. We have only the following species.

1. **ADIANTUM PEDATUM ALEUTICUM** Rupr. (Pl. 18, f. 1, 2.)

Maiden-hair Fern.

Blades smooth, thin, nearly circular in outline, 5–24 inches in diameter; petioles long, graceful, one or more times 2-forked, with the leaflets arising from the upper

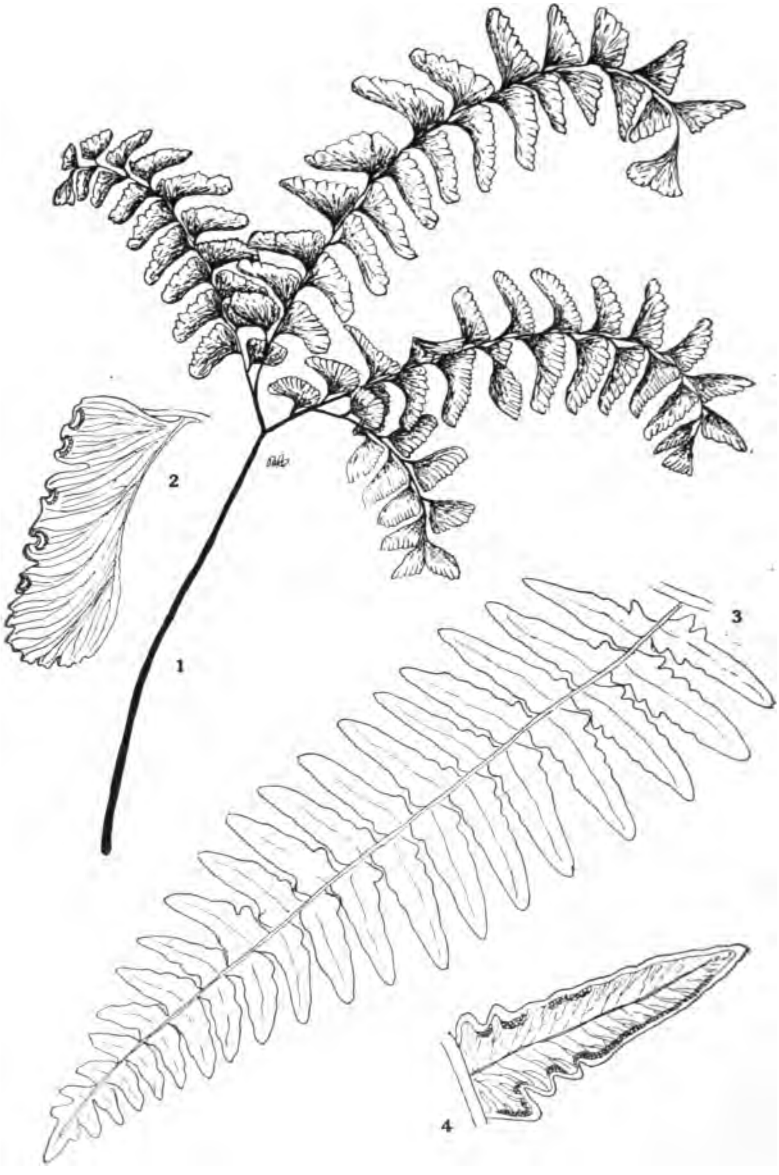

Plate No. 18.

1, 2 = *Adiantum pedatum aleuticum;* 1 = a leaf, × ⅓; 2 = a leaflet, under side, × 1. 3, 4 = *Pteridium aquilinum pubescens;* 3 = a part of a leaf, × ½; 4 = a leaflet, under side, × 1.

side of its branches; leaflets delicately stalked, 1-sided. —In damp shady places. Alaska to Quebec, south to California.

15. PTERIDIUM. BRAKE.

Leaves not tufted; blade 1–3-pinnate (3 in ours), large. Sori marginal, continuous, under the inrolled leaf-margin, on a marginal vein which connects the ends of the lateral veins. (Greek *pteron* = wing, hence also Greek *pteris* = a fern, because feather-like leaves are common in the group though not in this genus.)—The rootstocks were roasted and pounded, giving a flour used by the northwest Indians. The young shoots are eaten like asparagus by the French and Japanese. A bad weed in western Washington and Oregon. We have only the following species.

1. **PTERIDIUM AQUILINUM PUBESCENS** Underw. (Plate 18, f. 3, 4. Plate 19.)

Common Brake.

Rootstock stout, creeping, underground. Leaves 1–14 feet high, erect, covered with fine silky hairs especially beneath; petiole woody; blade triangular. Indusium double, outer formed of the incurved margin of leaf, inner attached within the receptacle and extending beneath the young sporangia.—The most common of our ferns.—Alaska to California and Arizona.

16. POLYPODIUM. POLYPOD.

Rootstock creeping, elongated; petioles articulated to slightly prominent knobs on scaly rootstocks; blade 1-pinnately divided. Sori round, large, naked, on tips of veins, one row on either side of mid-vein. (Greek *poly* = many, *pous* = foot, referring to the branched rootstock.)

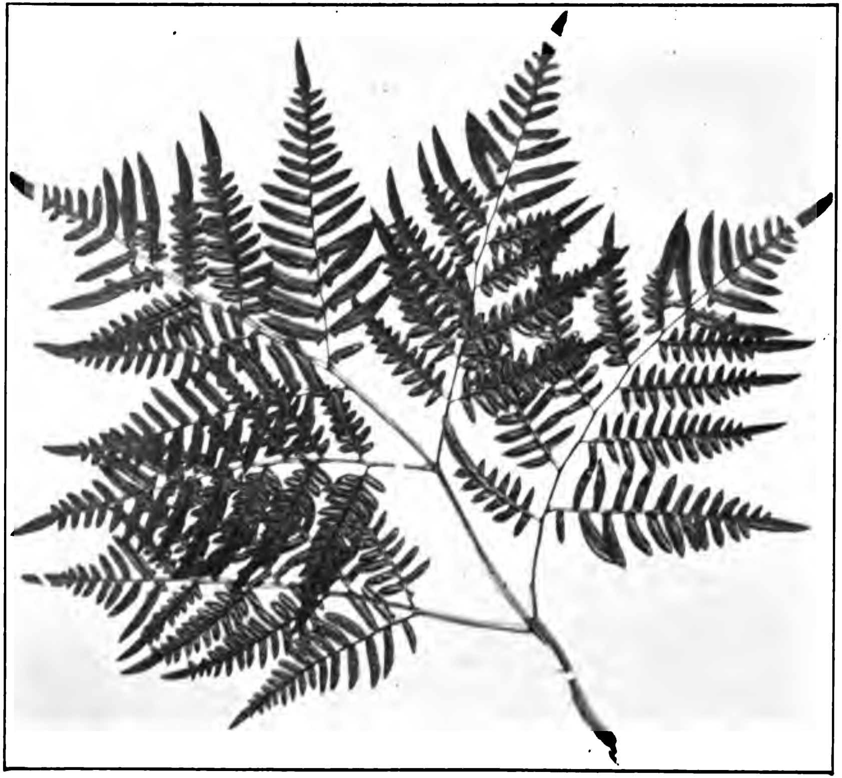

PLATE NO. 10.

A. Leaf-blade leathery, broadly ovate; margin of leaf-segments bluntly serrate. 1. *P. Scouleri.*

AA. Leaf-blade membranous, linear to oblong.

  B. Leaflets or leaf-divisions acute or acuminate, their margin sharply serrate. 2. *P. occidentale.*

  BB. Leaflets or leaf-divisions obtuse, their margin entire. 3. *P. hesperium.*

1. **Polypodium Scouleri** Hook. & Grev. (Pl. 20, f. 1, 2.)

Leather-leaf Polypod.

Leaf-blade leathery, broadly ovate, 3–12 inches long; leaf-segments linear to oblong, obtuse, the teeth rounded. Sori on upper leaf-segments.—Near sea-water. British Columbia to California.

2. **Polypodium occidentale** (Hook.) Max. (Pl. 20, f. 5, 6.)

Licorice Fern.

Rootstock yellowish. Leaves 6–18 inches long; blade 1½–4 inches wide, oblong to linear, acuminate, membranous; leaf-segments numerous, tapering from a wide base to an acute or acuminate tip, sharply serrate; veins free, with 2–4 veinlets. Sori near mid-vein.—On rocks, logs and tree trunks. Alaska to California and along the coast.—The rootstocks have a strong licorice taste and are often collected by children for chewing.

3. **Polypodium hesperium** Max. (Pl. 20, f. 3, 4.)

Leaves membranous, 2–6 inches long; blade ½–1½ inches wide, linear to oblong, obtuse to acute; leaf-segments short, rounded at tip, crenulate to entire; veins free, 1–2-forked. Sori large, midway between mid-vein and edge.—On dry rocky hillsides. British Columbia to Montana and Arizona.

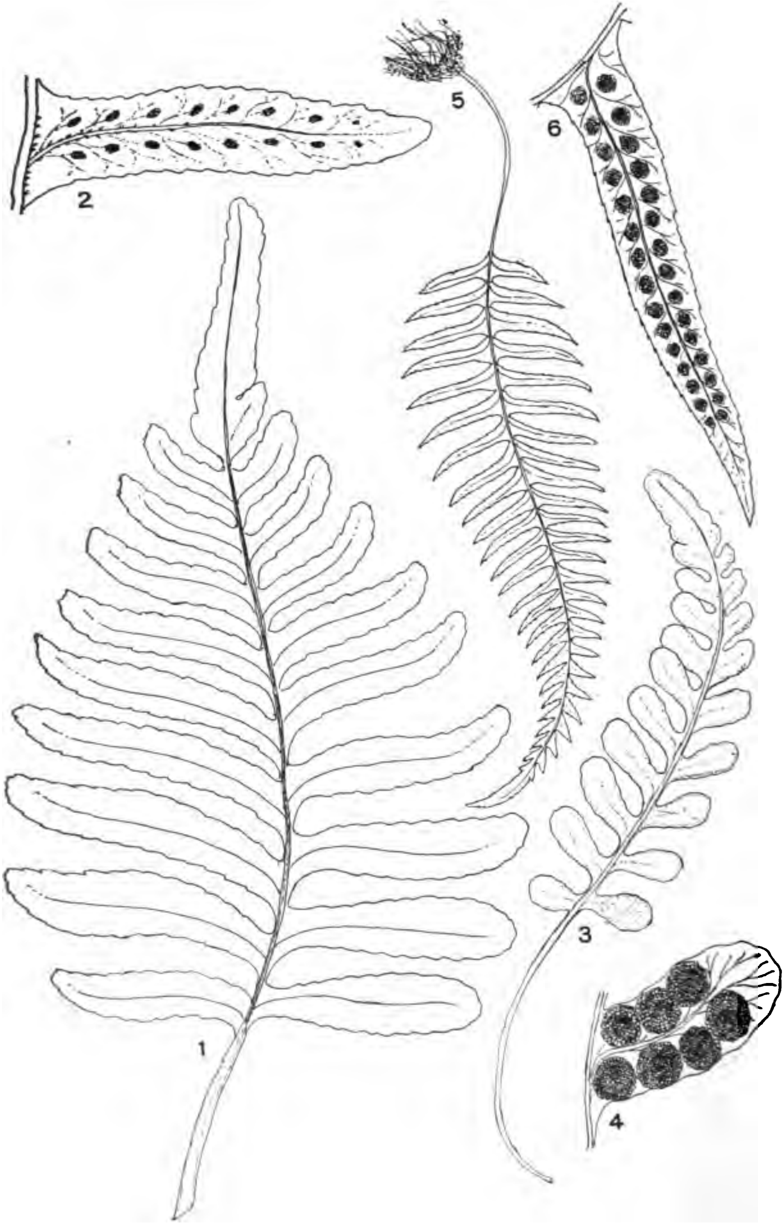

PLATE NO. 20.

1, 2 = *Polypodium Scouleri;* 1 = a leaf, × ½; 2 = a leaflet, × 1. 3, 4 = *Polypodium hespenium;* 3 = a leaf, × ½; 4 = a leaflet, × 1. 5, 6 = *Polypodium occidentale;* 5 = a leaf, × ¼; 6 = a leaflet, × 1.

MARSILIACEAE. *Clover-fern Family.*

Perennial, rooted in mud; rhizome slender, creeping. Leaves either filiform or 4-foliolate, long-petioled. Spore-leaves modified into spore-bodies (sporocarps) which are on peduncles arising near insertion of petiole of foliage-leaf. Spores of 2 sizes. We have only the following genus.

MARSILIA. CLOVER FERN.

Aquatic or in wet places; rootstock slender, creeping. Leaves palmately 4-foliolate, resembling 4-leaved clover. Spore-leaves modified into spore-bodies (sporocarps) with two small teeth near base. (Honor of A. Marsili, an Italian botanist.) We have only the following species.

1. MARSILIA VESTITA H. & G. (Pl. 21, f. 1.)

Petioles slender, 2–5 inches long; blade $\frac{3}{8}$–1 inch in diameter; leaflets wedge-shape or triangular to obovate, entire or slightly toothed, covered with soft white hairs. Spore-bodies (sporocarps) near leaf-base, on very short petioles, $\frac{1}{5}$–$\frac{3}{8}$ inch long, $\frac{1}{8}$–$\frac{1}{4}$ inch broad, densely covered with hair-like scales.—On wet silt or in shallow water. British Columbia to Kansas and Arizona.

SALVINIACEAE. *Floating-fern Family.*

Plants floating, small, somewhat elongated, sometimes branched. Leaves apparently in 2 rows. Spore-bodies (sporocarps) soft, thin-walled, 2 or more on the same stalk. Spores of 2 sizes in separate sporocarps. We have only the following genus.

AZOLLA. DUCK-WEED FERN.

Plants moss-like, pinnately branched; rootlets beneath. Leaves dense, imbricated, minute, 2-lobed. Smaller spore-bodies (sporocarps) acorn-shaped, con-

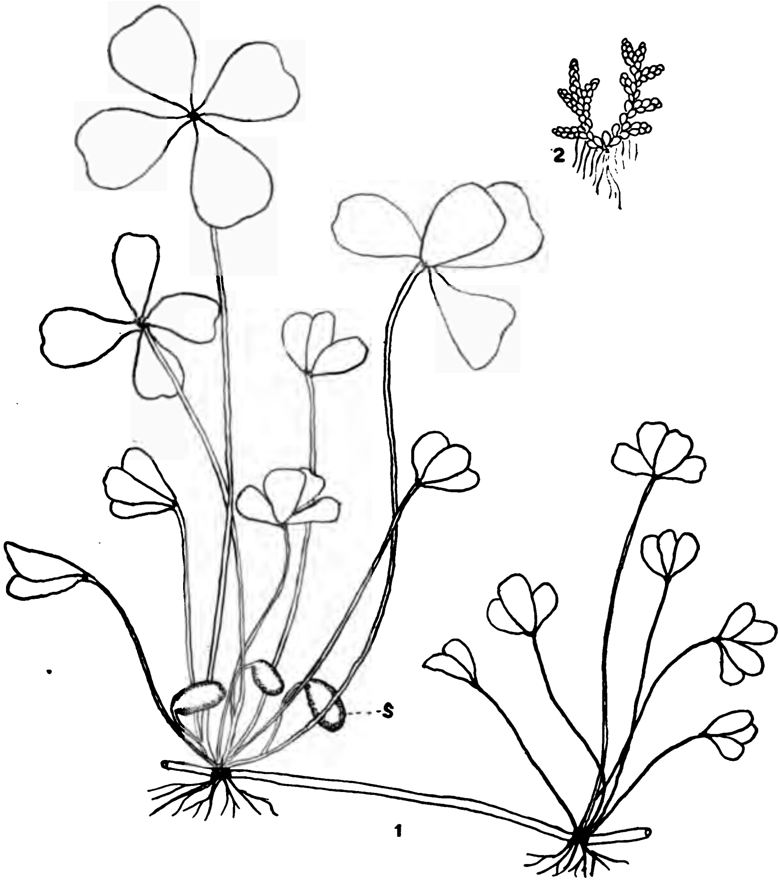

PLATE NO. 21.
1 = *Marsilia vestita*, s = sporocarp, × 1. 2 = *Azolla caroliniana*, × 2.

taining 1 megaspore; larger spore-bodies (sporocarps) globose, containing many stalked sporangia which each contain several masses of microspores. (Greek *azo* = to dry, *ollupi* = to kill; referring to the rapid death when taken from water.) We have only the following species.

1. AZOLLA CAROLINIANA Willd. (Pl. 21, f. 2.)

Plants ¼–1 inch long, reddish or greenish; sporocarps in the leaf axils. Cuticle of megaspore finely granulate. —British Columbia to Ontario, south to Florida and Mexico.

UNIVERSITY OF WASHINGTON, SEATTLE, WASH.

Ferns and their allies in Southern Franklin County, Maine.

CLARENCE H. KNOWLTON

Franklin County lies in western Maine, reaching from Canton, Rome, and Vienna, some 85 miles northwest to the Province of Quebec. It has an area of 1,764 square miles, about one-third larger than Rhode Island, or one-fifth the size of Vermont. It includes within its limits part of the Rangeley Lakes and most of the Sandy River valley. Of its 48 townships only about half are organized, and these occupy the southern portion of the county. The unorganized townships are covered with forests, mostly of the type called "Canadian," but there is also much hard wood.

My own acquaintance has been largely with the settled parts of the county, especially the region around my old home at Farmington, where I did my first fern collecting. Extensive collections of ferns have also been made in this region by Messrs. H. W. Jewell and A. H. Trundy, of Farmington, Miss L. O. Eaton, of Chesterville, and

Miss Kate Furbish, of Brunswick. This article sums up their work, as well as my own.

Polypodium vulgare L. is abundant in many places, and seems to like granitic rocks especially. In general the fronds are regular, but Mr. Jewell has found specimens of var. *auritum* Willd. *Phegopteris polypodioides* Fée is very common in moist open woods, while *P. Dryopteris* (L.) Fée is more often found in deeper woods. It was many years before I found the third species of the genus, *P. hexagonoptera* (Michx.) Fée. There are only four stations for it even yet, two in Farmington (H. W. Jewell), one in Chesterville (Miss Eaton), and the fine large stand which I found in open woods in Strong. It is decidedly a rare fern. *Adiantum pedatum* L. is very abundant in the rich humus of deciduous woods, and I have seen it flourishing in clearings and pastures where the woods have been removed. *Pteris aquilina* L. is exceedingly common in pastures and dry upland white birch woods.

When I made my first botanical visit to Chesterville, the southernmost town of the county, I invaded one of the peat-bogs, and was surprised and delighted to find a big fern growing there in abundance. Some of the fronds were five feet tall. This proved to be *Woodwardia virginica* (L.) Sm., and I have since found one more station for it, in the same town, at least sixty miles back from the present coast line.

Asplenium acrostichoides Sw. is very luxuriant in rich deciduous woods, while *A. filix-foemina* (L.) Bernh. flourishes in moist situations everywhere. *A. Trichomanes* L. is found only on moist ledges of Day Mt., in Strong and Avon, above an altitude of 1,000 feet, on the shaded side of the mountain. The specimens here are numerous and well developed, the best I have ever seen, some of the fronds at least 2.5 dm. in length. It is very different from the starveling specimens I

Day Mountain

have usually found in other places. *A. platyneuron* (L.) Oakes I never expected to see in Farmington, but Mr. Jewell finally discovered two lonely plants crouching beside a granite boulder in a large pasture. It is occasional in similar places twenty-five miles to the south in Kennebec and Androscoggin Counties, but here it seems to be out of range.

Polystichum acrostichoides (Michx.) Schott is common. Its incised variety seems to be caused, in some instances, by abnormal light exposure. I have found good specimens only in woods stripped of foliage by insects, and in recent clearings. The beautiful holly fern *P. Braunii* (Spenner) Fée was first found by Mr. Jewell at the foot of Day Mt., in Strong and Temple, but I have since found larger quantities of it at an elevation above 800 feet in the adjoining town of New Vineyard. Not only does it flourish in the rich rocky woods, but it has also persisted for many years in an adjacent pasture, where it is closely cropped by the cattle.

Of the genus *Aspidium*, *A. Thelypteris* (L.) Sw. and *A. noveboracense* (L.) Sw. are very common. *A. marginale* (L.) Sw. abounds in rocky woods, and I have one specimen of var. *elegans* J. Robinson, which grew on a glacial terrace near the river in Farmington. *A. Goldianum* Hook. is a very rare species, but very well developed in the three stations where it flourishes. It is far too large to make good herbarium specimens. *A. Boottii* Tuckerm. was first called to my attention by Miss Eaton, at Chesterville, but later I found it flourishing in rich wet woods at Farmington. It is one of our rare ferns. *A. cristatum* (L.) Sw. is frequent in wet open woods and swamps, but its variety *Clintonianum* D. C. Eaton, is very rare. I have not found it myself, but Messrs. Jewell and Trundy have found a few specimens. *A. spinulosum* (O. F. Müller) Sw. occurs frequently, while its beautiful variety *intermedium*

(Muhl.) D. C. Eaton is the most abundant fern of the deep woods. Above 1,200 feet elevation on the hilltops and mountain sides there is abundance of the very broad variety *dilatatum* (Hoffm.) Gray, forma *anadenium* Robinson. Nothing in the so-called "Canadian forest" is more beautiful than a mountain glade filled with this large but delicate fern.

Both species of *Cystopteris* are present, but they are not widely distributed. *Woodsia ilvensis* (L.) R. Br. is abundant on dry ledges in Strong, Wilton, and Chesterville, perhaps elsewhere. *Dicksonia* and *Onoclea sensibilis* L. are our two most common species in dry and moist soil. The latter, when cut with the grass in July, frequently develops later an anomalous frond which is best described as variety *obtusilobata* (Schkuhr) Torr. It is only a seasonal form. All along the intervales, and frequently on moist uplands, this species flourishes, and repeated frosts seem to have no effect on its roots. *O. Struthiopteris* (L.) Hoffm. is everywhere in the alluvium along the Sandy River, and occasionally on the higher land.

Of the Osmundaceae, all three species are abundant, but *Osmunda cinnamomea* L. is the most flourishing. Variety *frondosa* Gray and var. *incisa*, J. W. Huntington, have been detected by Mr. Jewell, but they are very far from common.

Ophioglossum vulgatum L. I have found several times. usually in dryish soil. It seems to like the shade of *Pteris*, and it is probably not rare, but it is so slender that it is frequently overlooked.

The other genus of this order, *Botrychium*, is well represented, both by species and by individuals. The little moonwort with the long name, *B. lanceolatum* (Gmel.) Ångstroem, var. *angustisegmentum* Pease & Moore is the rarest one, and I have found it in only three places in wet woods. *B. ramosum* (Roth) Aschers is occasional in dry woods. *B. obliquum* Muhl. is very abundant, and variety *dissectum* (Spreng.) Clute is not difficult to find. *B. ternatum* (Thunb.) Sw., var. *intermedium* D. C. Eaton is also very common, but var. *rutaefolium* (A. Br.) D. C. Eaton is rare, and rather indefinite. These leathery fronds are almost evergreen, and in late fall it is very interesting to walk across pastures and old fields, looking for the numerous variations in size and outline of the sterile fronds. The other species, *B. virginianum* (L.) Sw. is common in rich deciduous woods.

In *Equisetum* there is abundance of *E. arvense* L., *E. sylvaticum* L. and *E. fluviatile* L. Along the wooded terraces of the river there is a great deal of the scouring rush, *E. hyemale* L., var. *affine* (Engelm.) A. A. Eaton, much prized in the olden time under its vernacular name. *E. scirpoides* Michx. is occasional in cold evergreen woods, often near brooks. Until the past year I had not found *E. litorale* Kühlewein. Then I found it in wet gravel along the Sandy River at New Sharon, with no fruit.

Franklin County seems to be a paradise for *Lycopodium*. *L. lucidulum* Michx. flourishes in rich woods, *L. inundatum* L. in clayey fields and meadows. *L. annotinum* L. likes dry woods, and on the summits of the higher mountains there are several stations for the almost prickly var. *pungens* Desv. *L. clavatum* L. and var. *megastachyon* Fernald & Bissell flourish in the upland pastures. *L. obscurum* L. and var. *dendroideum* (Michx.) D. C. Eaton are also frequent in woods, pastures, and old fields. *L. sabinaefolium* Willd. I first found at Ft. Kent, in Aroostook County. When I returned to Farmington I had the agreeable surprise of finding several stations there, one of them five minutes' walk from home. Other collectors have doubtless had similar experiences. *L. complanatum* L. I have not found in Franklin County myself, but Miss Furbish once collected it in Strong, and it ought to flourish in the northern woods. Its variety *flabelliforme* Fernald is the most common *Lycopodium* of all. Last but not least is the very distinct *L. tristachyum* Pursh, its blue green foliage and deep running rootstocks furnishing two ready means of field determination. It seems to like a rather firm dry soil in the open.

I have never detected any Selaginellas in the county, and but one kind of *Isoëtes*, *I. echinospora* Dur., var. *Braunii* (Dur.) Engelm. This flourishes in the bottom of slow-moving streams, especially the Sandy River and its tributaries.

The following summary shows in brief the number of ferns and fern-allies I have mentioned.

	Species	*Varieties*
Polypodiaceae	26	7
Osmundaceae	3	2
Ophioglossaceae	4	4
Equisetaceae	6	1
Lycopodiaceae	8	4
Isoetaceae		1
	47	19

Those botanists who have collected elsewhere in northern New England will miss several species from the foregoing list. As only about a third of the 48 townships in Franklin County have been explored botanically, it is not for me to say that such plants as *Pellaea atropurpurea* do not grow within its limits. If there is any limestone area in the unexplored sections, it is more than possible that there are several other species. Further than this, there are such quantities of fern vegetation everywhere in woods, pastures, and swamps, that every opportunity is afforded for those entbusiasts who are interested in formal variations. I have found it a most interesting region, and I hope it may be visited by other fern collectors.

HINGHAM, MASS.

Ferns Collected in the Noyo River Canyon, Mendocino Co., Calif., Aug. 10-14.

H. H. TRACY

Botrychium silaifolium Presl.
Polypodium vulgare L.
" *falcatum* Kellogg.
Gymnopteris triangularis (Kaulf) Underw.
Adiantum pedatum L.
Struthiopteris spicant (L) Scop.
Woodwardia radicans (L) Sm.
Asplenium cyclosorum Rupr.
Dryopteris nevadensis (Eat) Undew.
" *rigida* var. *arguta* (Kaulf) Underw.
Polystichum munitum (Kaulf) Underw. Castella.
" *californicum* (D. C. Eaton) Underw.
" *aculeatum* (Swz) Roth.
Azolla filiculoides Lam.

IN THE REGION OF MT. SHASTA, CAL., AUG. 19-23.

Pteridium aquilinum var. *pubescens.* Castella.
Cryptogramma acrostichoides R. Br. Castle Lake.
Pellaea brachyptera (Moore) Baker. Castella.
" *densa.* Castella.
Asplenium cyclosorum Rupr. Castella.
Polystichum californicum (Eaton) Underw. Trail to Mt. Eddy.
" *munitum* (Kaulf.) Underw. Castella.
" *Lemmonii* Underw. Trail to Mt. Eddy.
" *Lonchitis* (L.) Roth. Castle Lake.

Filix fragilis (L.) Underw. Shasta Springs.
Isoetes lacustris L. Castle Lake.
FULLERTON, CAL.

Fern hunting in Florida, in the phosphate country.

M. A. NOBLE

In the gently rolling country lying to the south of Lake Tsala Apopka, for miles and miles, the only fern growing on the surface is the *Pteridium aquilinum* var. *caudatum.* The soil is classed as "rolling pineland" by the State Geological Survey, and it has considerable oak and other hardwood growth. Old settlers and native Floridians term it "Oak Ridges." For ten or fifteen miles south from the lake, this is the type of land, extending six or seven miles eastward to the rich "hammock" lands lying along the Withlacoochee River, and westward for a still further distance.

The region is honeycombed with prospect holes, dug by miners in search of phosphate of lime rock. Small holes appear everywhere at a distance of fifty feet apart. These holes measure a few inches across, and penetrate the earth from a few feet to thirty or even sixty. Not as frequent, but still quite numerous, are holes as wide as a common well, and of the same depth as the first-named. For the protection of stock, the law enjoins that these holes should be filled up, or covered. Small logs are usually laid across the top—a covering soon decayed, and more dangerous than the open well.

Down these well holes grow most tempting ferns, green and luxuriant on account of the dampness. Here are to be found *Polystichum acrostichoides, Asplenium parvulum, Woodwardia areolata* and *virginica, Dryopteris patens,* and occasionally, but very seldom, *Phlebodium aureum* and *Asplenium platyneuron.*

In some deserted pits, thirty or forty feet in depth, and irregular in outline, and an acre more or less in extent, may be found *Woodwardia areolata* and *virginica*, *Dryopteris patens*, and a few clumps of *Osmunda regalis*, with small clover-like fronds, growing in the crevices of the crumbling limestone cliffs.

In a digging along the railroad track, and in a washed-out ravine at one of the mines, *Dryopteris patens* has appeared, and grows vigorously. Both places are damp and well shaded. A miniature cave, a mile to the westward, is filled with a mass of the same fern. There appears to be a spring near for the rocks are always moist.

INVERNESS, FLA.

Ophioglossum Engelmanni in Missouri.

ERNEST J. PALMER

It was several years after I had begun collecting the ferns of Southwest Missouri, and particularly of my own county of Jasper, that I succeeded in adding Engelmann's adder's tongue to my list. Then I found a colony of it growing within half a mile of my home, an illustration of the fact that we frequently go far afield in our search for the strange and beautiful and overlook the wonders close at hand.

The station is at an altitude of about 1,100 feet, on a gently sloping hillside with north exposure, along a little branch near the town of Carterville, Missouri. On thin soil in irregularities of the Mississippian limestone, which here comes to the surface, a few xerophytic plants maintain a somewhat precarious existence amongst the common upland prairie species. The more characteristic of these are *Bouteloua curtipendula*, *Allionia albida*, *Tragia ramosa*, *Malvastrum angustum*, *Sedum* *pulchellum* and an *Opuntia*. Amongst these the Ophioglossum was growing, but had suffered considerably from the tramping of cattle, from which cause it is likely to be exterminated at no distant date. The plants were for the most part small and stunted, the best specimens being protected by some bushes of *Crataegus* and *Symphoricarpos orbiculatus*.

The following year I discovered another locality for this interesting fern, in the northwest part of Jasper County, near the mining camp of Neck City. The plants at this colony were well protected and consequently much more robust and typical. The altitude here is about 1,000 feet. Limestone bluffs 40 or 50 feet high, on the north side of Spring River, form an abrupt escarpment from the upland prairie. On a ledge of the rock a thin layer of residual soil and humus had accumulated, which in wet times is thoroughly saturated by seepage water from the higher levels. Later in the season it becomes very dry; but not before the Ophioglossum has run through its rapid season's cycle and become dormant for another year. The ledge has a southern exposure and is without shade. At the time I visited it (May 10, 1910) there were hundreds of fronds, some of them just developing the fertile segment and others already discharging the spores. In a number of plants two stems rose from a single rootstock and in a few cases three. In several specimens the fertile segment was bifid or two pronged. The average height of the plants was 12 to 15 centimeters, about a third of which was the stipe, while the fertile segment did not exceed the sterile by more than three or four centimeters. Whether this becomes much elongated later I cannot say, as I did not again visit the locality. However, the plants were much lower and less slender than in specimens of *O. vulgatum* I have seen. The greatest width of the sterile segments was about 20 to 25 millimeters. The network of secondary veins and the cuspidate tips were quite noticeable.

I am glad to say that this and another near-by station, on Spring River, of this rare fern are not likely to be disturbed, as they are rather inaccessible and are surrounded by rocky waste ground that is of little value for utilitarian purposes.

WEBB CITY, MISSOURI.

Notes on the Pteridophytes of the north shore of Lake Superior—II.

O. E. JENNINGS

In this JOURNAL for June, 1913, the writer gave a list of the pteridophytes collected during the summer of 1912 at various points along the north and northwest shore of Lake Superior, ranging from Fort William in the west to Heron Bay in the east, and extending northward to about twenty miles north of Nepigon. During the summer of 1913, the writer and Mrs. Jennings spent another period of three months in the same general region, but working for the most part in different localities. The pteridophytes collected during this second season have been very kindly worked over by Prof. L. S. Hopkins, and it is thought probably worth while as a further contribution to the known distribution of the pteridophytes of North America to publish a record of this collection also.

LYCOPODIALES

1. LYCOPODIUM LUCIDULUM Michx.

Base of Rabbit Mt., 3 mi. s. e. of Stanley; Maloney's Harbor, Magnet Point, Lake Superior; shore of channel, Porphyry Island, Lake Superior.

2. LYCOPODIUM ANNOTINUM L.

On sand-hills 3 mi. s. e. of Stanley; e. side Loon Lake;

rocky w. slope of Porphyry Island, Lake Superior; Little Fluor Island, Lake Superior.

3. LYCOPODIUM CLAVATUM L.

Along trail near Tee Bay, Thunder Cape, Lake Superior; Surprise Lake, Thunder Cape; top of Rabbit Mt., 4 mi. s. e. of Stanley; east side Loon Lake.

4. LYCOPODIUM OBSCURUM var. DENDROIDEUM (Michx.) D. C. Eaton.

Woods on sand-hills 3 mi. s. e. of Stanley and at base of Rabbit Mt., 4 mi. s. e. of Stanley; alder swamp, Edwards Island, Lake Superior; Little Fluor Island, Lake Superior.

5. LYCOPODIUM COMPLANATUM L.

Along trail near Tee Bay, Thunder Cape; on rounded knob in black spruce forest and on edge of granite bluff, Little Fluor Island, Lake Superior.

6. SELAGINELLA SELAGINOIDES (L.) Link.

Under alder fringe at edge of inlet, Maloney Harbor, Magnet Point, Lake Superior. Although reported as "very common along the north shore of Lake Superior" (Macoun, Cat. Canadian Plants, Pt. V, p. 291) the writer did not collect it in 1912 and saw it but the once in 1913.

EQUISETALES

7. EQUISETUM ARVENSE L.

Wooded coastal cliff 5 mi. north of Magnet Point, Lake Superior; low ground at mouth of Oliver Creek, near Stanley; swamp at head of Fluor Island channel, Lake Superior.

8. EQUISETUM SYLVATICUM L.

Cultivated fields on sand-hills 3 mi. s. e. of Stanley; top of sphagnum mound in muskeag, Porphyry Island, Lake Superior.

9. **EQUISETUM FLUVIATILE** L.

In a bog at Mission and along flats at mouth of Kaministiquia River, Ft. William.

OPHIOGLOSSALES

10. **BOTRYCHIUM LUNARIA** L.

Grassy plot at cabin, Porphyry Island, Lake Superior.

11. **BOTRYCHIUM VIRGINIANUM** (L.) Sw.

Sand-hills, Banksian pine barren, 3 mi. s. e. of Stanley; east side of Loon Lake; Maloney Harbor, Magnet Point, Lake Superior.

12. **BOTRYCHIUM ONONDAGENSE** Underw.

Boggy trail near Grass Lake, Silver Islet, Thunder Cape, Lake Superior.

FILICALES.

13. **OSMUNDA CLAYTONIANA** L.

Valley near Loch Lomond, 6 mi. s. of Ft. William; new road clearing in sand-hill region 3 mi. s. e. of Stanley; east side of Loon Lake.

14. **OSMUNDA REGALIS** L.

Between granite knobs n. of Loon Lake.

15. **POLYPODIUM VULGARE** L.

On slate cliff, Oliver Creek, 3 mi. s. e. of Stanley; east side of Loon Lake; exposed rounded islet with stunted spruce and birch, near Fluor Island, Lake Superior.

16. **PHEGOPTERIS PHEGOPTERIS** (L.) Underw.

Face of upper cliff, Ft. William; slate ravine at base of Rabbit Mt., 3 mi. s. e. of Stanley, also face of slate cliff, Oliver Creek, near Stanley; Maloney Harbor, Magnet Point, Lake Superior; on rounded exposed rock near Fluor Island and on top of rocky knob, Fluor Island, Lake Superior.

17. PHEGOPTERIS DRYOPTERIS (L.) Fée.

Face of slate cliff, Oliver Creek, 3 mi. s. e. of Stanley; east side of Loon Lake; Maloney Harbor, Magnet Point, Lake Superior; woods near coast of Paps Harbor, Black Bay peninsula; Little Fluor Island, Lake Superior; woods near lighthouse, Porphyry Island, Lake Superior.

18. PTERIDIUM AQUILINUM (L.) Kuhn.

Banksian pine barrens, sand-hills 3 mi. s. e. of Stanley; south of Loon Lake.

19. CRYPTOGRAMMA STELLERI (Gmel.) Prantl.

Face of cliff, Tee Bay, Thunder Cape; face of cliff, Little Fluor Island, Lake Superior.

20. ATHYRIUM FILIX-FOEMINA (L.) Bernh.

Common in moist places; sand-hill region 3 mi. s. e. of Stanley; islet in Porphyry Island channel, and interior of Edwards Island, Lake Superior; near Paps Harbor, and back of Maloney Harbor, Black Bay peninsula; Little Fluor Island, Lake Superior; east side Loon Lake.

21. DRYOPTERIS THELYPTERIS (L.) Gr.

Bog back of Indian Mission, Ft. William.

22. DRYOPTERIS FRAGRANS (L.) Schott.

Face of slate cliff, Oliver Creek, 3 mi. s. e. of Stanley; east side of Loon Lake; face of glacial cliff at Paps Harbor, Black Bay peninsula; talus slope of knob, Little Fluor Island, Lake Superior.

23. DRYOPTERIS SPINULOSA (Muell.) Kuntze.

Edge of clearing, sand-hill region 3 mi. s. e. of Stanley; Maloney Harbor, Magnet Point; alder swamp, Edwards Island, and top of knob, Little Fluor Island, Lake Superior.

24. DRYOPTERIS SPINULOSA var. DILATATA (Hoffm.) Underw.

Along trail, Tee Bay, Thunder Cape; dark woods, Porphyry Island, Lake Superior.

25. DRYOPTERIS RIGIDA (Hoffm.) Underw.

Boggy woods near lighthouse, Porphyry Island, Lake Superior.

Among other things Prof. Hopkins notes that "The one real reason for calling it *rigida* is that it has the glands on the under side of the frond." After comparing the specimens with some European specimens of *rigida*, Prof. Hopkins continues "Lay the two sets of specimens before you and read this line from Eaton: 'It has a larger and broader frond than the European *A. rigidum* but certainly presents no points of specific distinction; and some of the Oregon specimens collected by Mrs. Summers near the Willamette River are so nearly typical *rigidum* that they would not be challenged if mixed with European specimens.'" Further,—of Watson's description (Botany California, Vol. II, p. 346) the following is noted by Prof. Hopkins as being true of the Lake Superior plant: "Fronds one or two feet long, borne on moderately long very chaffy stalks, smooth and green above, paler and glandular beneath, ovate-lanceolate in outline, usually bipinnate; pinnae oblong lanceolate, the lowest ones broadest and a trifle shorter than the middle ones; pinnules oblong (?), incised (?), conspicuously veiny: sori large(?) nearer the midvein than the margin; indusium firm, convex, orbicular with a very narrow sinus, the edge glandular."

D. rigida has heretofore been recorded only from the Old World and in America from Alaska to California, the latter records being regarded by Underwood as represented by a variety (*D. rigida* var. *arguta* (Kaulf.) Underw.).

26. FILIX BULBIFERA (L.) Underw.

Face of slate cliff, Oliver Creek, 3 mi. s. e. of Stanley.

27. FILIX FRAGILIS (L.) Bernh.

Upper cliff Mt. McKay, Ft. William; face of slate cliff, Oliver Creek, 3 mi. s. e. of Stanley; rocky islet and on talus slope, Little Fluor Island, Lake Superior; face of glacial cliff, Paps Harbor, Black Bay peninsula.

28. WOODSIA ILVENSIS (L.) R. Br.

Eight additional records, faces of cliffs, rocks, and talus slopes: Loon Lake, Silver Islet, Thunder Cape; Paps Harbor, Black Bay peninsula; Fluor Island group, Lake Superior.

29. WOODSIA ALPINA (Bolton) S. F. Gray.

Silver Islet, Thunder Cape, on ancient glacial deposits which form cliff.

30. WOODSIA GLABELLA R. Br.

On face of cliff at top of Little Fluor Island, Lake Superior.

31. ONOCLEA SENSIBILIS L.

In sand-hill region 3 mi. s. e. of Stanley.

32. MATTEUCIA STRUTHIOPTERIS (L.) Todaro.

Along Oliver Creek about 3 miles southeast of Stanley.

During the 1913 trip the islands and peninsulas in the northwestern part of Lake Superior were more thoroughly explored than was the case in 1912, and a comparison of the two lists will show a considerable difference in the relative pteridophyte floras of the regions covered. Altogether sixteen names (species, varieties, or forms) not reported in the present paper were included in the first paper, so that with the additions for the season of 1912, the total record for the two collections of pteridophytes is forty-eight; for the region extending from about twenty miles west of Fort William to Heron Bay and north to about twenty miles north of Nepigon.

CARNEGIE MUSEUM, FEBRUARY 25, 1914.

American Fern Society

THE FERN GARDEN

Fern students interested in the cultivation of ferns should make themselves known to the editor as he frequently receives requests for information along these lines. It is probable that a considerable number of the members of the Society have something in the line of a fern bed where they transplant occasional finds or fine plants of common species. Others go in for fern growing much more extensively and get all the species, both native and foreign, that are obtainable. For example, a member wrote recently that he had found a dealer who would supply plants of *Asplenium septentrionale.* The editor has on hand catalogues of dealers in live ferns who supply a large variety of native ferns. Recently a letter was received from Scotland asking the names of fern growers who might be interested in exchanging live plants. The editor was able to send him only a small number of names. If there are others among the readers of the JOURNAL who would also be interested along this line, send in your name to the editor, and it will be kept for reference. Furthermore, we shall be glad to publish each month any requests for specials or for information, and also a list of those who desire to exchange live plants.

Mr. H. G. Rugg wants to know where he can obtain plants of *Polystichum Lonchitis* and *Schizaea.* Mr. Alexander Cowan, Valleyfield, Penicuik, Midlothian, Scotland, President of the British Pteridological Society, and a new member of the American Fern Society, wishes to exchange live plants or spores of various species and fern varieties. Mr. F. L. Pickett, another new member (address on next page) wants spores of *Cheilanthes tomentosa* for experimental purposes.

New Members to be added to the 1913 list of members:

Miss H. Ella Jones, 23 South St., Utica, N. Y.
Mrs. Charles W. Lee, Jr., 80 South Burrett St., New Britain, Conn.
Dr. Edwin H. Munger, 902 Main St., Hartford, Conn.
Mr. Fermen L. Pickett, 435 South Dunn St., Bloomington, Ind.
Mr. Alex. Cowan, Valleyfield, Penicuik, Midlothian, Scotland.
Prof. Howard S. Brode, Whitman College, Walla Walla, Wash.
Miss Una L. Foster, 857 Beacon St., Boston, Mass.
Dr. Mina Baker Mitchell (Mrs. C. D. Mitchell), Care Case Plow Co., Chattanooga, Tenn.
Miss Nellie F. Dunton, 14 Green St., Bath, Maine.
Mr. Andrew S. Parsons, 144 Lincoln St., New Britain, Conn.
Mr. E. B. Webster, Care of the Webster Publishing Co., Port Angeles, Washington.

Changes of Address:

M. S. Baxter, 46 Bly St., Rochester, N. Y.
Miss H. Mary Cushman, 437 West 124th St., Reading, Pa.
C. M. Goethe, 2615 K St., Sacramento, Cal.
F. C. Greene, Room 409, U. S. Geological Survey, Washington, D. C.
D. F. Higgins, Care of American Legation, Peking, China.
Mrs. B. W. Labaree, 47 Garden St., Hartford, Conn.
George L. Moxley, 1445 Regina Lane, Los Angeles, Cal.
R. C. Benedict, 2303 Newkirk Ave., Brooklyn, N. Y.
Mrs. M. W. Satchwell, 143 North 6th St., Jacksonville, Fla.
Mrs. W. W. Steere, 16 Holmfield Ave., Mattapan, Mass.

Professor Ora Willis Knight died at Portland, Maine, Nov. 11, 1913, aged 39. Professor Knight was a chemist by profession and had served the state of Maine in that capacity from 1897 until his death. He was also a naturalist of wide interests and knowledge. He had published a work on the birds of Maine and various articles in ornithological and botanical periodicals, and had gathered a large herbarium in which Maine plants are very fully represented, and collections of minerals, birds, and insects. All these collections he bequeathed to the Smithsonian Institution: his scientific books, pamphlets, and papers go to the Bangor Public Library.

Several members have written that they will attend the proposed field day, but generally without specifying time or place, although one writes "at any time or place." Members who expect to be able to attend are again asked to send in word if possible specifying time and place preferred. If New York City is chosen the editor will be glad to be one of the guides and can probably attend almost any time during July and August. Please let us know what to expect. In order to be definite, suppose we say tentatively New York City, July 15th or thereabouts. To those who send in their names, the exact time and place will be forwarded.

President Bissell sends the following notices:

Mr. L. S. Hopkins, who was elected Secretary of the American Fern Society for 1914, having felt obliged by the pressure of other duties, to resign, I have accepted his resignation and appointed Mr. C. A. Weatherby, of East Hartford, Ct., to fill out the unexpired term.

C. H. BISSELL, *Pres.*

The Judge of Elections having declared no election of Treasurer, the Advisory Council has declared the election of F. G. Floyd, of West Roxbury, Mass., as Treasurer of the American Fern Society for 1914.

American Fern Journal

Vol. 4 JULY—SEPTEMBER, 1914 No. 3

Some new American species of Dryopteris

CARL CHRISTENSEN

Since the publication of the first part of my monograph of the genus Dryopteris just a year ago I have examined a number of specimens collected recently in tropical America, some of which are found to belong to species hitherto undescribed. The present article contains descriptions of these and is thus a first year's supplement to the first part of the monograph. There is included also mention of two older species with which I was unacquainted before.

Dryopteris (*Lastrea*) **Shaferi** Maxon & C. Chr., sp. nov.

Rhizome erect, 2–3 cm. high, 1 cm. thick, with many branched roots, furnished at the top with few brown, rather rigid, small (2–4 mm. long) scales, these ciliate by short, subulate, simple hairs. Stipites fasciculate, many together, rather strong and rigid, 4–6 cm. long, sulcate and very shortly pubescent above, rounded and nearly glabrous beneath, without scales. Lamina linear-lanceolate, 20–30 cm. long, 4–6 cm. broad at the middle, coriaceous, grayish green, short-acuminate, gradually tapering downward through 4–6 pairs of very reduced, auriculiform pinnae, pinnate-subbipinnatifid. Rachis very shortly pubescent by simple, spreading, acute hairs. Pinnae numerous (in larger fronds 30–40-jugate), sessile, alternate or subopposite, spreading, linear, generally more or less falcate, about 4 cm. long, 3–4

[No. 2 of the JOURNAL (4: 41-76) was issued June 9, 1914.]

mm. broad, acute or short-acuminate, glabrous, the costa beneath excepted, this very minutely hairy; base of pinnae with a rounded or subacute auricle on each side (basal segments); margins of pinnae crenate or more or less pinnatifidly incised, most deeply so at the middle and on the lower side, the latter usually more deeply lobed than the upper, still scarcely halfway to the costa; outer third of the pinnae often quite entire, like several of the lower and shorter pinnae. Lobes rounded, oblique. Veins raised above, furcate or simple in the entire part of the pinnae, pinnately branched in the lobes with 4 or 5 branches (tertiary veins), the two basal ones reaching the margin above the sinus between the lobes. Sori near the margin, this sometimes revolute and covering the sori. Indusium large, brown, reniform, hispid (especially on the edges) by simple setae. Sporangia glabrous.

CUBA: Vicinity of Camp San Benito, Oriente, altitude 900 meters, on the ground, February 24, 1910, *J. A. Shafer* 4037 (U. S. Nat. Herb. no. 657791, type). Quite the same plant also from Camp La Gloria, south of Sierra Moa, Oriente, Cuba, *J. A. Shafer* 8094, 8215 (U. S. Nat. Herb.).

Dryopteris Shaferi is closely related to *D. scalpturoides* (Fée) C. Chr., agreeing with it in most essential characters, differing from it mainly in its very narrow pinnae, which are less incised and glabrous above. In general habit our new species recalls *D. sagittata* (Sw.) C. Chr., especially its variety *tenebrica* (Jenm.) C. Chr.; but that species, belonging to the subgenus Goniopteris, is in all important characters widely different. The resemblance between the two is due to the narrow, hastate or sagittate pinnae. *Dryopteris Shaferi* is remarkable, among the species of the section Lastrea, in having its pinnae crenate, or barely pinnatifid, in which character it agrees only with the otherwise very different *D. brachypoda* (Bak.) C. Chr.

Dryopteris (*Lastrea*) **Jimenezii** Maxon & C. Chr., sp. nov.

Rhizome obliquely erect, scaly at the top. Stipites fasciculate, 3 or 4 together, 5–10 cm. long, rigid, channelled, without hairs, but in the lower part densely chaffy by castaneous, glossy, entire, ovate-acuminate scales, these up to 1 cm. long and easily deciduous. Lamina lanceolate, 30–50 cm. long, 10–15 cm. broad near the middle, upward gradually tapering into the pinnatifid apex, downward rather suddenly narrowed with 4 or 5 pairs of auriculiform pinnae, dark green, thinly membranous or firmly herbaceous, bipinnatifid. Rachis slender, slightly pubescent, especially above, by short, unicellular, appressed hairs. Pinnae alternate or subopposite at distances of 2–3 cm., sessile, acuminate, the middle ones 7–8 cm. long, 1.5–1.8 cm. broad, their midrib on both sides slightly hairy like the rachis, the surfaces with some few very inconspicuous appressed hairs (especially on the veins), pinnately incised to a narrow (1 mm.) costal wing. Segments about 1 cm. long, 2-3 mm. broad, obtuse or subacute, patent or a little oblique, considerably widened at the base and separated by broad but acute sinuses, their margins regularly and obtusely toothed or crenate; basal segments equal to the others or a little shorter. Veins simple, remarkably distant and distinct, about 6 to each side, nearly at right angles to the costula, running into the teeth. Sori small, supramedial, exindusiate. Sporangia few, early deciduous, glabrous.

COSTA RICA: San Jerónimo, altitude 1500 meters, collected by C. Wercklé, in April, 1910; Herb. Otón Jiménez no. 567 (U. S. Nat. Herb. no. 861635, type).

This new species is certainly a close ally of *D. supranitens* Christ and *D. tablaziensis* Christ, both from Costa Rica, resembling them in the presence of numerou scales on the stipes below, a character rather rare within the subgenus Lastrea. From the former it differs in its non-glossy upper surface and in its patent and toothed segments; from the latter in its shorter pinnae, nearly glabrous rachis, and toothed segments. A pronounced character is found in the broad bases of the segments.

Dryopteris (*Lastrea*) **ptarmiciformis** C. Chr. & Ros. Repert. Sp. Nov. Fedde **12**: 472. 1913.

BOLIVIA: *Buchtien* 3545. Near *D. oligocarpa*, the segments very oblique; indusium distinct. Its systematic position will be between *D. oligocarpa* and *D. pilosula.*

Dryopteris (*Lastrea*) **subandina** C. Chr. & Ros.; Repert. Sp. Nov. Fedde **12**: 472. 1913.

BOLIVIA: *Buchtien* 3120. In habit not unlike *D. pachyrachis*, but having the sporangia setose as in *D. concinna.* This species should be inserted between *D. concinna* and *D. rufa* in the key.

Dryopteris (*Lastrea*) **arborea** Brause, nom. nov

Dryopteris roraimensis Brause, Notizblatt d. Kgl. Bot. Gart. Mus. Berlin. **6** (no. 54): 109. 1914 (non C. Chr. Ind. 289. 1905).

BRITISH GUIANA: Mt. Roraima, *Ule* 8526.

A very interesting novelty with a caudex 1 to 2 meters high and leaves nearly 1.5 meters long, bipinnatifid. In technical characters it is closely related to *D. Glaziovii*, from Brazil, and *D. euchlora*, from Ecuador, and its var. *inaequans* C. Chr., from Central America, from which it differs by several characters; for example, in its castaneous, glossy rachis.

Dryopteris (*Goniopteris*) **nephrodioides** (Kl.) Hieron. var. **glandulosa** C. Chr. & Ros. Repert. Sp. Nov. Fedde **12**: 473. 1913.

BOLIVIA: *Buchtien* 3410. A form with yellow glands on the under surface, a character hitherto not observed in the subgenus Goniopteris.

The following two species were not dealt with in the first part of my monograph. An examination of authentic specimens of both shows that they ought to have been included in the groups of species there treated.

Dryopteris (*Goniopteris*) **trinidadensis** (Jenm.) C. Chr. Ind. 298. 1905.

Polypodium trinidadense Jenm. Gard. Chron. III. **18**: 235. 1895.

TRINIDAD: Maiacas Falls, *J. H. Hart*, Bot. Gard. Herb. Trinidad no. 5886 (Kew!).

The single sheet in the Kew Herbarium, consisting of one leaf without rhizome, named by Jenman, shows a plant that in habit resembles *Stigmatopteris Carrii* and allied species very much, but is in reality a Goniopteris of the section Eugoniopteris. It agrees in nearly all characters with *D. straminea* (Bak.) C. Chr. and may be a form of that species. It differs from it in its acute or even submucronulate teeth, the serrated acuminate apex of the pinnae (which are about 1.5 cm. broad), the non-gemmiferous rachis (an accidental character), and by having only 2 or 3 tertiary veins on each side of the secondary vein, the two basal ones terminating in the leaf-tissue and free, the upper ones running out to the thickened margin. In size, color, perfectly glabrous frond, stramineous costae, shape of pinnae, sori, and kind of venation, the two forms wholly agree. Having seen only the rather fragmentary authentic specimens of both, it is not possible to decide now whether *D. trinidadensis* is a form of *D. straminea;* but I am much inclined to so regard it. *Dryopteris straminea* was described from a single leaf collected by Fendler (no. 474), in Tovar, Venezuela, a locality very rich in ferns, many of which are found also in Trinidad.

Dryopteris (*Stigmatopteris*) **cyclocolpa** (Christ) C. Chr. Ind. 260. 1905.

Polypodium cyclocolpon Christ, Bull. Herb. Boiss. **4:** 659. 1896; Bull. Soc. Bot. Belg. **35**: 216. 1896.

COSTA RICA: Forêts de Tsâki, Talamanca, *Tonduz* 9480.

A fragment, consisting of a pair of pinnae of the type-collection, in the U. S. National Herbarium (no. 832908), shows that this species is a genuine Stigmatopteris. Regarding Stigmatopteris as a valid genus, which it certainly is, the species must be called **Stigmatopteris cyclocolpa** (Christ) C. Chr., comb. nov. It is very different from the other Central American species of Stigmatopteris, but is closely related to *S. prasina* (Bak.) C. Chr., from Peru. The lamina is bipinnate-tripinnatifid; pinnae lanceolate, 25–30 cm. long 8–10 cm. broad, fully pinnate in the lower two-thirds. Pinnulae 4–5 cm. long, 10–12 mm. broad at the base, sessile, the upper broadly adnate and decurrent, acuminate, with a serrate apex, lobed ⅔–¾ of the way to the midrib. Lobes rectangular, 2–4 mm. broad, serrate, especially at the obtuse or truncate apex. Veins mostly 4-jugate in the lobes, simple. Sori supramedial. Leaf grass-green, firmly herbaceous or membranous, distinctly pellucido-punctate, without hairs, but with some red-brown narrow scales on the lower part of the midrib of the pinnae beneath.

Stigmatopteris cyclocolpa differs from *S. prasina* in its much larger pinnae, these with many free pinnules which are more deeply incised, with serrated lobes.

In my monograph (page 79) I have mentioned under *S. prasina* a plant from Ecuador collected by Sodiro. This is very closely related to *S. cyclocolpa* and may be a form of the same species. It differs in its furcate veins, its more deeply, but not so sharply serrated lobes, and its larger pinnules.

Christ[1] has mentioned *Polypodium prasinum* Bak. as occurring in Costa Rica (*Pittier* 7504). For the present I cannot say what species he has so determined; it is scarcely a Stigmatopteris.

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[1] Bull. Soc. Bot. Belg. 35: 217. 1896.

Up to the present time *S. cyclocolpa* and *S. prasina* are the only species of the genus known which are fully bipinnate with pinnatifid pinnulae. Even the very large *S. contracta* (Christ) C. Chr. is bipinnatifid only, with the large segments again deeply incised.

COPENHAGEN, May, 1914.

Preliminary list of the ferns of the coast region of South Carolina north of Charleston*

LAURA M. BRAGG

The present paper is based on records from the Charleston Museum's plant survey of South Carolina. This survey aims to record for each species in South Carolina, (1) all published references to occurrence within the state, (2) data relative to herbarium specimens collected within the state, and, (3) the distribution of species as indicated by collecting and ecological study in different sections of the state.

For this summary of the ferns of the coast region north of Charleston the published sources have been John Bachman's Catalogue of phaenogamous plants and ferns, native or naturalized, found growing in the vicinity of Charleston, South Carolina, 1834; Henry W. Ravenel's Catalogue of the natural orders of plants inhabiting the vicinity of the Santee Canal, S. C.;† Lewis R. Gibbes' Botany of Edings' Bay;‡ W. C. Coker's three papers, The garden of André Michaux,* Observations on the flora of the Isle of Palms,† Plant life of Hartsville, S. C., 1912; and R. M. Harper's A midsummer journey through the coastal plain of the Carolinas and Virginia.‡

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*Reprinted with the addition of several paragraphs, and some modifications of the synonymy from the Bulletin of the Charleston Museum 10: 17-22. Feb. 1914.

† *Proc. Amer. Assoc. Adv. Sci.*, 2-17. 1830.

‡ *Proc. Ell. Soc.*, I, Oct., 241-248. 1857.

The herbaria consulted have been the Gray Herbarium, and those of the New York Botanical Garden, the University of Nebraska, Clemson College, and the Charleston Museum. Citations of specimens in the latter are marked (H), and refer chiefly to Ravenel's herbarium from the vicinity of the Santee Canal, upon which his Catalogue is based, and to specimens of my own collecting within the last four years. A few specimens are from Francis Peyre Porcher.

Further records are from the survey, based on my personal observations.

The region treated is restricted to that portion of the coastal plain of South Carolina which lies north of Charleston. Systematic collecting has been done at only a few localities, principally in the vicinity of Charleston and north to the Santee River, in what are now Charleston and Berkeley Counties. This is the classic ground worked by Bachman, Ravenel, and Porcher; Bachman about Charleston, and Ravenel and Porcher in the parishes of St. John's Berkeley and St. Stephen's, on the north and south sides respectively of the Santee canal. Since their day but little botanical work had been done in this region until the Charleston Museum a few years ago started its plant survey of the state. My own records for localities outside of Charleston and Berkeley Counties have been made during two short trips, one to Sumter and Stateburg, June 22–24, 1912; and the other to Chicora Wood on the Pee Dee River, about fourteen miles north of Georgetown, March 21–

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* *Jour. Elisha Mitchell Scientific Soc.*, **27**: 65-72. July, 1911.

† *Torreya*, **5**: 135-145. Aug., 1905.

‡ *Bull. Torrey Botanical Club*, **36**: 351-377. 1907.

26, 1913. As ferns were the object of neither trip, I find only a few specimens included among my notes and collections. The flora of the extreme inner edge of the coastal plain has been studied by Prof. Coker at Hartsville. He lists twelve species of which all but *Lycopodium adpressum* have been found common in the lower coastal region.

The total number of species listed is thirty, five of which are from Bachman's Catalogue, unsubstantiated by specimens and possibly erroneous. Six species which the manuals credit to South Carolina should be looked for in the coast region, namely, *Ophioglossum vulgatum* L., *Botrychium biternatum* (Lam.) Underw., *B. obliquum* Muhl., *Asplenium dentatum* L., *Lycopodium lucidulum* Michx, and *Selaginella acanthonota* Underw.

Several species usually found on limestone rocks, which are recorded by Bachman only, may again be found on some of the lime marl outcrops of the Ashley and Cooper Rivers. Since Bachman wrote, most of these have been worked for phosphate rock, causing the removal of surface lime. Careful and more extended search will probably reveal northern species in the counties bordering on North Carolina, while southern species are likely to be found in the vicinity of Beaufort. *Dryopteris floridana* (Hook.) Kuntze, now first recorded for South Carolina, is probably only one of several extralimital southern species which might be found in the coastal plain of the state.

The nomenclature here followed is that of the second edition of Small's Flora of the Southeastern United States.

I wish to express my thanks to Miss Margaret Slosson and Dr. B. L. Robinson. Dr. Robinson has most generously furnished me with data for over six hundred specimens of South Carolina plants in the Gray Herbarium, including pteridophytes.

OPHIOGLOSSUM CROTALOPHOROIDES Walt. ADDER'S-TONGUE. Light soil in pine woods.

Records. Bachman: Charleston. Ravenel: Santee Canal (H).

BOTRYCHIUM VIRGINIANUM (L.) Sw. RATTLESNAKE FERN. This species is probably common but the older herbaria have preserved no specimens of it. Bachman lists it for Charleston and Ravenel doubtless refers to it as one of his two species of *Botrychium, Ophioglossum crotalophoroides* from his herbarium being the other. Miss Mabel Webber and I found it fairly common at Otranto, in low mixed woods bordering the swamp to the west of the railroad. On April 27, 1913, the spores had fallen.

Records. Bachman: Charleston. Webber and Bragg: Otranto (H).

OSMUNDA CINNAMOMEA L. CINNAMON FERN. Common and abundant on the mainland in wet woods and borders of swamps; occasional in roadside ditches. Fiddleheads appear about the first week of March and mature spores may be found early in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Georgetown County, Otranto (H), Summerville, Sumter. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal.

OSMUNDA REGALIS L. ROYAL FERN. Common but less abundant than *O. cinnamomea,* with which it is usually associated. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Ten Mile. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal.

POLYPODIUM VULGARE L. COMMON POLYPODY. Recorded by Bachman only and that possibly erroneously, as he fails to list the very common *P. polypodioides.*

POLYPODIUM POLYPODIOIDES (L.) A. S. Hitchcock. RESURRECTION FERN; GRAY POLYPODY. Common throughout the coastal region on trunks and large branches of trees, particularly of live oaks. Occasionally found in sand at the base of trees and on old buildings, even on tile roofs. In mild seasons, such as 1913 and 1914, growth continues throughout the year and prothallia and young plants may be found in January. This and *Pteridium aquilinum* are the common ferns of the sandy coast islands; both are found throughout the state.

Records. Bragg: Cainhoy, Charleston, Ingleside, Isle of Palms (H), Otranto, Santee Swamp, Ten Mile. Coker: Hartsville, Isle of Palms. Porcher: St. Johns Berkeley (H). Ravenel: Santee Canal (H). Robinson: Summerville (Gray Herb.). Sinkler: Eutawville (H).

PTERIS MULTIFIDA Poir. A tradition persists in Charleston that the common introduced fern until recently determined as *Pteris serrulata* L. f. was brought here from Europe by the Huguenots, and it is often called the Huguenot or Mediterranean Fern. On the other hand, local students claim that Prof. Lewis R. Gibbes discovered it here in 1868 and determined it as *P. cretica.* The first reference to the occurrence of a naturalized Pteris in South Carolina appears in the *Proceedings of the Elliott Society**, where Professor Gibbes reports "an undetermined species of *Pteris,* found about a month since, in fruit, in Wentworth St., near the corner of Rutledge, growing on the brick foundation of a wooden house, on the south side of the street. * * * the fern is growing freely, and it is like none of those known to inhabit this state. Its origin and the time of its introduction are unknown." No further reference to the discovery is made in the Elliott Society's *Proceedings,* and no specimens of an introduced Pteris from Professor Gibbes' herbarium have been traced. Professor

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* II Dec., 1868, 61–62.

Gibbes' daughter, Miss Emma Gibbes, tells me that her father transplanted several of the ferns from Wentworth Street to the wall of his laboratory at the College of Charleston. From here he permitted the collector, A. H. Curtis, several years later to take many specimens, which were distributed as *P. serrulata.* J. Donnell Smith also collected here April 16, 1880 (Gray Herb.). Since then the fern has become abundant on the many shaded old brick walls of the city. Modern progress is its enemy and the advent of fresh paint and plaster mark its retreat. It is, however, holding its own and has spread beyond the city. I have found it plentiful on a modern brick culvert at the Navy Yard, Dr. D. S. Martin has noted it on the Theological Seminary at Columbia since 1898 or 1900, and Miss Anna Sinkler has recently sent me specimens from "Eutaw," near Eutawville.

Miss Margaret Slosson has kindly examined for me the South Carolina specimens of this species in the herbarium of the New York Botanical Garden and finds, beside eight sheets from Curtis, one collected by Eggleston at Eutawville, on "Locks of Santee Canal." That Eutawville is fifteen miles from the Santee Canal is of little importance, but it is of interest to know that Eggleston, probably in the eighties, found this introduced species in Ravenel's own country. Ravenel's Catalogue was devoted exclusively to native plants, but his fern herbarium includes numerous foreign and cultivated species. Neither the herbarium nor his manuscript catalog of it contain any trace of our fern, as surely they must have, had it been near the Santee Canal previous to 1850. Ravenel, further, in 1882, in his List of the more common native and naturalized plants of South Carolina* gives only two species of *Pteris,*—"*aquilina*" and "*cretica.*" The latter is surely a mistake for

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* S. C. Board of Agriculture South Carolina, 351, 1883.

serrulata. Ravenel could not have failed to know of Professor Gibbes' discovery. He may, however, have examined only young specimens, which frequently lack the decurrent character of the leaf. Scarcely three years before the species was still undetermined, as Prof. D. C. Eaton wrote,* "I learn from Prof. Lewis R. Gibbes, that a Pteris has sowed itself and grown abundantly on the walls of the College of Charleston, S. C. It will be very interesting to know whether this is *Pteris cretica* or *Pteris serrulata.*" Miss Gibbes, who was her father's amanuensis, tells me that he sent specimens to Professor Eaton for determination. Chapman includes the species in the supplement to the 1884 edition of his Flora as *P. serrulata* from Charleston. In the main text of Professor Gibbes' copy of this edition he has added *P. serrulata* in pencil to the given species of *Pteris,* but makes no mention of *cretica.*

Although the ferns have disappeared from the Wentworth Street house and the laboratory at the College of Charleston was taken down after the earthquake of 1886, there is no room to doubt that the present well-known *P. serrulata* L. f., or *P. multifida* Poir according to most recent synonomy, is the fern of Professor Gibbes' discovery and that the belief that *P. cretica* has ever been taken in Charleston is an illusion based on Ravenel's error.

The species is deciduous in Charleston; growth continues throughout the year, however, and young plants may be found in January. Spores mature in April.

PTERIDIUM AQUILINUM (L.) Kuhn. BRACKEN. Common throughout coast region, in open sandy woods. With scrub oaks this species forms the typical undergrowth where the pine barrens are frequently burned over. It is the only fern of the dry, lightly-wooded sea islands and is characteristic of the open grassy borders of the jungle on more densely covered islands. Spores mature in May.

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* Bull. Torrey Bot. Club, 6: 307, 1879.

The variety *pseudocaudatum* Clute is well represented by a specimen from the Santee country, collected by Ravenel and labeled by him *P. caudata*. Bachman's *P. caudata* must also, in all probability, be referred to this form. I have, however, searched extensively but unsuccessfully for a distinct variety in the vicinity of Charleston.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Dewees Island, Georgetown County, Isle of Palms, Otranto, Sullivan's Island, Summerville, Sumter. Coker: Hartsville, Isle of Palms, Ten Mile. Gibbes: Edings' Bay. Harper: "intermediate pine-barrens." Robinson: Charleston Navy Yard (Gray Herb.).

PELLAEA ATROPURPUREA (L.) Link. CLIFF BRAKE. Recorded by Bachman, probably erroneously.

ANCHISTEA VIRGINICA (L.) Presl. VIRGINIA CHAIN-FERN. Abundant in freshwater swamps and ditches and in low wet woods, associated with the Cinnamon Fern, Net-veined Chain-fern, and, in woods, with the Lady Fern and Florida Shield-fern.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Georgetown County, Summerville, Sumter. Coker: Hartsville, Ten Mile. Harper: "damp sandy places." Ravenel: Santee Canal.

ASPLENIUM PLATYNEURON (L.) Oakes. EBONY SPLEENWORT. One of the most common ferns. Associated with *Pteris serrulata* on old walls in Charleston. Grows luxuriantly on wooded banks, and particularly along artificial ditches. Fertile leaves measuring four to five inches wide and twenty inches long, with deeply serrate pinnae, are characteristic of highly developed plants. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston, Georgetown County, Ingleside, James Island, Otranto, Stateburg. Coker: Hartsville. Ravenel: Eutaw Springs, Santee Canal.

ASPLENIUM TRICHOMANES L. Recorded by Bachman only.

ASPLENIUM RUTA-MURARIA L. Recorded by Bachman only.

ATHYRIUM FILIX-FOEMINA (L.) Roth. LADY FERN. Frequent in rich damp woods. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Otranto. Coker: Hartsville. Ravenel: Santee Canal.

LORINSERIA AREOLATA (L.) Presl. NET-VEINED CHAIN-FERN. Very abundant in freshwater swamps and along the rice field canals.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Otranto, Georgetown County along rice lands of Pee Dee and Waccamaw Rivers, St. Andrews Parish (H), Sumter. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal (H).

ONOCLEA SENSIBILIS L. SENSITIVE FERN. Not common.

Records. Bachman: Charleston. Bragg: St. Andrews Parish (H). Ravenel: Santee Canal (H).

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. CHRISTMAS FERN. Common in dry mixed woods near the coast. At Stateburg found in a deep gorge. Brought into Charleston throughout the year by the negro women selling flowers.

Records. Bachman: Charleston. Bragg: Cainhoy, Otranto (H), Plantersville, Stateburg. Porcher: St. Johns Berkeley.

DRYOPTERIS NOVEBORACENSIS (L.) A. Gray. NEW YORK FERN. Recorded by Bachman, probably erroneously for *D. thelypteris*, a common species near Charleston.

DRYOPTERIS THELYPTERIS (L.) A. Gray. MARSH SHIELD-FERN. Common in wet woods.

Records. Bragg: Charleston Navy Yard (H). Coker: Isle of Palms.

DRYOPTERIS PATENS (Sw.) Kuntze. Several plants on an old brick tomb at Goose Creek Church, Otranto, are all that I have found. Dr. B. L. Robinson kindly determined the species for me. Chapman, in the third edition of his Flora, includes South Carolina in its range but Small does not.

Records. Bragg: Otranto (H). Ravenel: Eutaw Springs (Gray Herb.).

DRYOPTERIS FLORIDANA (Hook.) Kuntze. FLORIDA SHIELD-FERN. Not previously recorded for South Carolina. Abundant in several localities at the Charleston Navy Yard, growing in damp woods along streams running through the pine barrens. Associated in one particularly rich spot with the Cinnamon and Royal Ferns, both Chain-ferns, the Marsh Shield-fern, and within a few yards of the Lady Fern and *Selaginella apus*. The leaves are evergreen and in winter lie stretched on the ground in a circle, the fertile ones often over three feet in length. Spores mature in late May and early June.

Records. Bragg: Charleston Navy Yard (H).

DRYOPTERIS HEXAGONOPTERA (Michx.) C. Chr. BROAD BEECH-FERN.

Records. Bachman: Charleston. Porcher: St. Johns Berkeley (H).

PHEGOPTERIS PHEGOPTERIS (L.) Underw. LONG BEECHFERN. Recorded by Bachman, undoubtedly erroneously.

WOODSIA RUFIDULA Beck. Recorded by Bachman only. It is unlikely that a Woodsia should occur in this region and I am unable to form any opinion regarding the species referred to.

AZOLLA CAROLINIANA Willd. FLOATING FERN. Floating in still water.

Records. Ravenel: Santee Canal (H).

LYCOPODIUM ADPRESSUM (Chapm.) Lloyd & Underwood. CLUB MOSS. Coker records this species as plentiful at Hartsville "in savannas and in slightly dryer situations than the preceding" (*L. alopecuroides* L.).

LYCOPODIUM ALOPECUROIDES L. FOX-TAIL CLUB MOSS. Common in damp pine land.

Records. Bragg: Georgetown County (H). Coker: Hartsville. Ravenel: Santee Canal (H).

LYCOPODIUM CAROLINIANUM L. LITTLE CLUB MOSS. In low plne barrens.

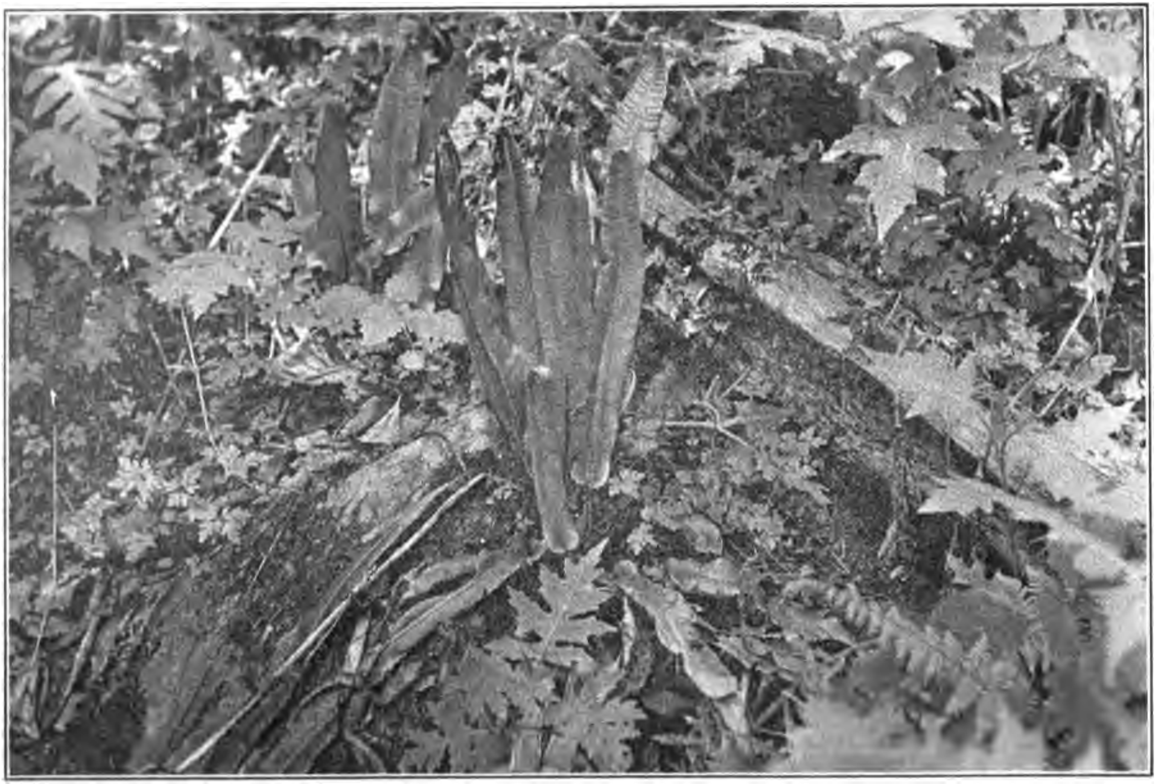
Records. Bachman: Charleston. Bragg: Summerville (H). Coker: Hartsville.

PSILOTUM NUDUM (L.) Griseb.

Records. Ravenel: Santee Canal (H).

SELAGINELLA APUS (L.) Spring. CREEPING SELAGINELLA. Frequent but not abundant in shady places along the swampy margins of freshwater streams, growing in sand mixed with vegetable mold. Found throughout the year.

Records. Bragg: Charleston Navy Yard (H), Otranto. Ravenel: Santee Canal (H).



PHYLLITIS AT HOME.

(94)

At home with the Hart's Tongue

R. C. BENEDICT.

To the writer's mind the hart's tongue is the most interesting of all our American ferns. It is probably not the rarest; certainly it is not the most beautiful, but there is a charm about it in its exclusiveness and its odd appearance which render it distinct. Probably added to this, in the writer's mind is the fact that it grows in the limestone hills of his home section of Central New York which a boyhood of tramping after wild flowers and ferns made especially cherished in memory.

The hart's tongue became an object of interest to me through the accounts of it in Parsons' "How to Know the Ferns" which indeed made all the ferns described interesting. With knowledge that it grew in the Jamesville region a few miles southeast of my home town I began to tramp frequently in that direction and to look as I found later, in the most unlikely places for it. For a while I examined almost every plant of broad-leaved sedge along the roadside. I was the veriest beginner. I discovered afterward that it was too exclusive to frequent the roadside.

Finally I found it after a long day's tramp in the region west of Jamesville. I had hunted for it all day without success, and was making all speed to get back to the road where I had left my wheel. The description of this locality will furnish a good idea of all the stations for hart's tongue in the Jamesville region. I had reached the edge of a ledge of limestone overlooking a small valley. The limestone dropped twenty to fifty feet or more in places to a steep talus of large sharp chips of the limestone. Below the talus sloped steeply to the bottom of the valley two hundred feet or more below. The top of the talus slope was fairly open with a few scattered butternuts and basswoods.

Fifty feet from the foot of the ledge, however, began a dense growth of white cedar through which one had to push by main force, and as the rocks of the talus were heavily moss-covered, and rotting logs were everywhere, traveling was several degrees harder than walking down stairs.

I came that afternoon to the top of that ledge in a particular hurry. My wheel was at the foot of the slope and I had then several miles of hilly road to supper. There happened to be a break in the ledge at that particular point and I climbed down that and was perhaps twenty feet down the open part of the talus when I stopped, no longer in a hurry. There was a plant of hart's tongue with its leaves pushing up perpendicularly from the slope of forty-five degrees. The roots were a pocket of soil covered by fragments of the limestone which is very loose at the top of such a talus and furnishes insecure footing. Before I went home I had seen probably forty plants of the fern. Afterwards, on later trips I found stations containing two or three times as many plants. Always they occurred in similar situations, near the top of a steep talus, with a ledge above, and a dense shrubby growth below which served as an admirable protection from the ordinary tramper. One exception may be noted where a few stunted plants were found at the top of a ledge on the sides of crevices several feet deep. I found the last mentioned station in a snow storm in weather too cold to allow an ordinary camera shutter to work properly.

The plant illustrated grew in a station not far from the first one found. The picture which was taken about the middle of June, shows the evergreen last year's leaves sloping down the face of the rock by which this particular plant grew. In the lower right corner of the picture is a leaf of *Cystopteris bulbifera* which luxuriates everywhere along the talus with leaves two and three feet long. There are quantities also of Herb Robert. The oak-leaved plant is a composite whose name I do not remember. Below the hart's tongue, in the cedar thickets were occassional sods of thick moss covered with numerous fine plants of *Camptosorus*. Not very many other species of ferns grew in the immediate neighborhood of the hart's tongue, but below in the valley there was a very good assortment. My story would not be complete here unless I tell how many kinds I have found in how restricted an area. I think I could now after a sufficient number of swings, drive a couple of golf balls so that the triangle between their starting and stopping places would enclose twenty-five kinds.*

The station I first found has since disappeared from causes I do not know. Perhaps trees fell so as to leave the slope too open and exposed to the sun. Perhaps others found it, and collected too many plants. I collected one plant for my fern garden when I first found the place, but afterward swore off taking plants as too liable to lead to the extinction of the stations, and I would not now take any one to see the fern growing except with the understanding that only leaves would be collected. With such an understanding I should like to be one of a group of the members of the Society to make a trip to the Jamesville region some summer.

BROOKLYN, N.Y.

A peculiar form of Pellaea atropurpurea Link.

F. L. PICKETT.

On a limestone ledge, known locally as Cedar Cliff, about three miles northwest of Harrodsburg, Monroe County, Indiana, the Cliff Brake, *Pellaea atropurpurea* Link., is found growing luxuriantly and abundantly.

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*One ought to drive a golf ball at least two hundred yards.

Early the past spring the writer noticed marked difference in the color of different clumps and in the shape of their pinnae. The difference is so noticeable, some being pure leaf green or but slightly tinged with the peculiar blue-glaucous tint and the other scarcely appearing green but rather dark blue-green, that the clumps can be distinguished from a considerable distance. Reference to descriptions at hand failed to clear the matter up, for the other differences, noted below, which are evident after careful examination of the plants are most peculiarly mixed up in the usual descriptions. Two questions have arisen, viz: Which of these, if either, is to be taken as the type of *P. atropurpurea* Link? Is the other a representative of another species or a variety of the above? At the suggestion of Dr. Benedict, to whom the question was referred, a full statement of the differences is submitted in the hope that some one will set the matter right.

In general the following description fits both forms. Rootstock short and densely clothed with hairlike scales. Stipes tufted, dark brown to black, 3-15 cm. long. Fronds coriaceous, lanceolate to ovate in outline, pinnate or twice pinnate below. Veins obscure, commonly twice forked. Indusium formed of the slightly membranaceous, incurved margin of the pinna.

The differences are given in detail below. The difference in shape and color of pinnae largely disappears when the specimens are dried, the rather thicker broad leaf form rolling its margins much more than the other unless unusual pressure is used, and the blue-green becoming much more nearly leaf green. In making examinations for the following notes both living and dried plants have been used. For convenience of reference the two forms will be designated as the long leaf (l. l.) and the broad leaf (b. l.) forms.

Stipe and rachis:

(l. l.) Hirsute with long delicate hairs, appressed, persistent, more abundant on the upper portion and extending to the stalks of the pinnae, giving the whole a scabrous appearance.

(b. l.) Naked or with very few scattered, spreading hairs, surface smooth, polished darker than in (l. l.)

Fertile Pinnae:

(l. l.) Upper, simple, stalked except the topmost pair, narrowly lanceolate or oblong to linear, reaching 5 x 45 mm, smooth and pure green above, light green or whitish below with scattered, colorless hairs on the midvein, many halberd shaped or forked. Apex acute, base truncate or slightly cordate. Lower pinnae pinnate with one to five pairs of ovate to lanceolate pinnules. Stalks of compound pinnae up to 2 cm. long.

(b. l.) Upper pinnae ovate to elliptical, sometimes oblong, rarely larger than 4 x 20 mm., sessile except the lower pairs, apex rounded or slightly emarginate; base truncate or cordate, sometimes auricled and clasping. Upper surface bluish, glaucous green, otherwise smooth. Lower surface smooth with veins almost free from hairs at all ages. Lower pinnae completely or incompletely pinnate with ovate pinnules or broad rounded lobes.

Sterile Pinnae:

(l. l.) Upper pinnae simple, ovate-oblong to oblong, up to 12 x 25 mm. Margin strongly crisped with a narrow (.25 mm.) membranaceous border. Apex rounded or acutish, base cordate. All but the top pair are stalked with stalks up to 6 mm. in length. Upper surface, smooth, true green and showing the veins more plainly than in the broad leaf form. Lower surface, whitish green and smooth except the midvein which has many long, scattered, colorless hairs. Lowest pinnae compound with one or two pairs of pinnules in every way like the simple pinnae.

(b. l.) Simple pinnae, cordate to ovate or elliptical, up to 8 x 15 mm. Margin, plane with a wider (.5 mm.) membranaceous border. Apex, broadly rounded to emarginate; base cordate or clasping. Pinnae crowded or overlapping, blue-glaucous above, smooth and slightly lighter green below. Lower pinnae lobed or pinnate with orbicular or cordate pinnules, sometimes short stalked.

Scales at Base:

(l. l.) Linear, two to ten cells wide at base and extending into very long and slender tips, colorless or yellow, rusty in mass.

(b. l.) Linear-lanceolate, ten to twenty cells wide at base, without the long slender tips, orange to brown in color.

Spores:

(l. l.) 47-62μ x 58-78μ, ovoid, with a few prominent, uneven ridges, giving the spores a ragged appearance.

(b. l.) 58-78μ x 79–109μ, obscurely tetrahedral, with numerous slight ridges, appearing almost smooth and darker than the (l. l.) form.

Culture experiments are now in progress to determine whether or not there are differences in gametophytic structure. The results of these will be reported later.

The original descriptions are not available here, but taking Eaton's description as a basis it seems that the (l. l.) form is nearer the type, varying from the description in the acute tips of the fertile pinnae, the longer

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and rather narrower sterile pinnae with strongly crisped margin, and the presence of many appressed hairs on the stipe. Probably the nearest description of the (b. l.) form is that of *P. glabella* by Mettenius and Kuhn; but the writer has not seen the full text of that description. Eaton considers *P. glabella* as a regional form of *P. atropurpurea*. If the (b. l.) form is the same as *P. glabella* it is certainly distinct enough for consideration. If it does not fit that description it is certainly worthy of a place as a form or variety of *P. atropurpurea* and might probably be designated as var. *latifolia* of that species.

Any notes of similar forms found elsewhere or any suggestions as to diagnosis will be very welcome.

BOT. DEP. INDIANA UNIVERSITY,
BLOOMINGTON, INDIANA.

American Fern Society

EAST HARTFORD, CONN., JULY 19, 1914.

To C. H. BISSEL,
President American Fern Society:

The detailed vote on the revision of the Constitution of the American Fern Society is as follows:

Total number of votes cast	62
Necessary for adoption	42
For	60
Against	2

The revised Constitution is therefore adopted.

C. A. WEATHERBY, *Secretary*.

SOUTHINGTON, CONN., JULY 25, 1914.

Acting in accordance with the result of vote as announced by your Secretary, I hereby declare that the revised Constitution, as presented by your committee, Mr. R. A. Ware and Mr. E. J. Winslow, has been regularly adopted and is now the recognized and official Constitution of the American Fern Society.

C. H. BISSELL, *President.*

Google

To the Members:

Your president has had two matters brought to his attention on which it seems desirable to get an expression of the wishes of the members. One is as to whether the Fern Society shall hold a meeting at Philadelphia in connection with the meeting of the American Association for the Advancement of Science, Dec. 28th to Jan. 2d; the other is as to whether the Fern Society shall hold a meeting in connection with those to be held by other natural history societies at San Francisco in April next year. It is desirable that your officers should be informed as to whether there would be a probable attendance at such meetings sufficient to justify arranging for them.

Will not all members who think they could attend either of these meetings, if held, send a postal giving the information to the Secretary of the Fern Society, so that your officers may be able to act intelligently.

C. H. BISSELL, President.

George F. Cleveland was killed by electric shock at Miraflores Locks, on the Panama Canal, on May 23, 1914.

Mr. Cleveland was born in Oneonta, N. Y., in 1876. From his earliest boyhood he was deeply interested in the natural sciences, and while at Brown University became a member of the Louis Agassiz Society. He was the possessor of a large collection of Lepidoptera of the United States, and, later, of the Isthmus of Panama. Entomology was always his favorite hobby. About eight years ago he became interested in the study of ferns, and joined the Fern Society.

His last four years were spent in the service of the Isthmian Canal Commission at Porto Bello, Panama, and his life was lost in the service of his country.

THE ANNUAL FIELD MEETING

West Englewood, New Jersey, July 15, 1914.

Owing to the unpropitious weather conditions on the day appointed for the field meeting, the attendance at the actual point of rendezvous was somewhat meagre, although quite a number of members of the Society were in New York.

Pennsylvania alone was represented at West Englewood by one member.

On this member then devolves the pleasant duty of reporting the proceedings for the Society.

The editor of the FERN JOURNAL had made every necessary arrangement for the meeting and had notified the Germantown members and others interested, of the details on the Friday preceding the date of the proposed event. Fitful showers ushered in the week, throughout the whole territory adjacent to New York, and on the eve of the day appointed for the field meeting the rain fell in torrents so that the proposed trip assumed the complexion of an elimination race in which the honors would go to the swift and the battle to the strong.

The member from Pennsylvania left Philadelphia on the 5:25 train, Wednesday morning, arriving at headquarters in New York at eight o'clock, and at the Forty-second Street Ferry at half past eight, five minutes before the appointed time for the departure of the train for the last leg of the journey. No other members were there and on signaling the S. O. S. wireless "Flatbush 668M," established by the editor for the benefit of members, the member from Pennsylvania learned that owing to weather conditions and the non-arrival of members, the trip had been declared "off" for the day, details being given for the trip of the Torrey Club to Staten Island the day following.

The train for West Englewood was ready, however, and the Pennsylvania member proceeded to that point and opened the meeting a la solitaire. The roll call was then taken up, beginning with the Empire State with its fifty-six members, and no answers being heard Massachusetts providing the treasurer of the Society was polled without response. Then Pennsylvania with its twenty members, third in point of numbers, was called, responding with one resonent "present" that made the welkin ring, or words to that effect. Of course, the proceedings were held entirely in "Soliloquy," the only audible disturbance, the sighing of the humid, ambient air through the antler like foliage of the "Bull Moose hybrid" *Onoclea sensibilis* protruding from the neighboring thicket.

Roll call finished and a quorum "counted," new business was taken up and discussion opened (a la Selkirk, of course) as to the selection of a suitable fern floral emblem for the great Commonwealth of Pennsylvania, an idea suggested by the Germantown Independent Gazette. All fern students present agreed that Pennsylvania, the Keystone State of the arch of the Republic, with its one hundred named species and varieties of ferns should have for its official and eternal floral emblem some member of its interesting fern flora.

W. A. Poyser, in his fern flora of Pennsylvania, says "From the standpoint of the fern student the flora is a most interesting one. The geographical position of the State is such that quite a number of northern species find their southern limit within its borders while some southern forms just pass north of its limits giving it a goodly admixture."

Within the boundaries too of the Keystone State are the type stations of *Asplenium pinnatifidum*, *Isoetes* *riparia, Nephrodium cristatum* × *Goldieanum* and *Asplenium ebenoides.*

The work of selecting from the checklist of its fern flora the plant most suitable to typify the floral characteristics of the State and foster in the minds of its school children a state pride and patriotism as suggested by House Bill 888 was the question before the meeting. (All this in soliloquy.) What fern then should be chosen? Not *Asplenium pinatifidum*—not *Isoetes riparia*—not *Asplenium ebenoides*—not *Nephrodium cristatum* × *Goldianum*—not any one of these but *all* of them, together with the rich and varied fern flora of American Ferns. "The Fern" simply should be chosen as the emblem. Pennsylvania, Penn's woods, PENNSYLVANIA! with its

> "Rocks and rills; its woods and templed hills"

nominates, appropriate and proclaims as its official floral emblem "The Fern."

The day was half gone and no other member appearing, the sole representative of the Society was graciously put aboard a returning train by Dr. M. S. Ayres, the village host, and the 1914 field meeting had passed into history. The following belated members were found next day at the "Shore Day" outing of The Torrey Club: Dr. and Mrs. N. L. Britton, Miss Pauline Kaufman, Prof. R. A. Harper, Dr. Marshall A. Howe, Dr. Ralph C. Benedict, Norman Taylor, and the member from Pennsylvania.

GERMANTOWN, PA. JAMES GRIMSHAW SCOTT.
JULY 18, 1914.

NEW MEMBERS

Laird, J. A., 274 N. Goodman St., Rochester, N. Y.
Leibelsperger, W. H., Fleetwood, Pa.
Marshall, Dr. Ruth, Rockford College, Ill.

CHANGED AND CORRECTED ADDRESSES

Flynn, Mrs. Nellie F., 251 S. Willard St., Burlington, Vt.
Jenney, Hon. Chas. F., Court House, Boston, Mass.
Mansfield, Miss Nellie F., 168 Neal St., Portland, Me.
Mattern, Edwin S., and Walter, 1042 Walnut St., Allentown, Pa.
Moxley, Geo. L., 526 W. Ave. 53, Los Angeles, Cal. (As in Annual List, changed inadvertently in preceding number.)
Robinson, Miss Winifred J., Women's College of Delaware, Newark, Del.
Spalding, Mrs. William, 405 Comstock Ave., Syracuse, N. Y.
Satchwell, Mrs. M. W., 143 West 6th St., Jacksonville, Fla.
Steere, Mrs. Wm. W., 10 Holmfield Ave., Mattapan, Mass.

DECEASED

Cleveland, George F., at Miraflores Locks, Panama, May 23,
Knauff, Mrs. Martha Ryland, at Pensacola, Florida, Dec., 1913.

ADDITIONS TO THE HERBARIUM

Mrs. M. A. Noble, of Inverness, Florida, recently sent a small contribution to the Society Herbarium. The lot included two species of *Asplenium*, *A. firmum*, and *A. myriophyllum*, which were new to the herbarium.

The four-page leaflet accompanying the present number is designed to aid members in advertising the Fern Society and the JOURNAL. A large number were printed and members who know of people to whom they might be of interest are urged to send to Mr. Winslow for as many as may be needed, or to send him addresses to which it would be worth while to send copies of the leaflet or sample copies of the JOURNAL.

NOTICE TO DELINQUENT MEMBERS.

The attention of the members is called to the provision of the new Constitution as to delinquent members. The Council will feel obliged to enforce the rules and this is the last number of the JOURNAL which will be sent to members who are too far in arrears.

C. H. BISSELL, *President.*

The election of new officers this year will be the first to be held under the new Constitution. It is to be hoped that a large number of members may avail themselves of the opportunity of voting.

Notice should be taken of the change in price of back numbers indicated on the second page of the cover. The need of increasing the price brings realization of the fact that the JOURNAL is now in its fifth year of publication, the first number having been issued in August, 1910. With another number the fourth volume will be completed. It may be of interest to note that the copy for this number is entirely assured, the greater part of it being already in galley proof. It was most desirable to keep the present number within the space of twenty-four or twenty-eight pages in order to complete the year entirely on the income at present absolutely assured. But it proved difficult to cut the present number, so the paring will have to fall on the last number for the year, unless some generous member is moved to send the treasurer a money order (check will probably be accepted) to cover any deficit caused by last number. If only the delinquents referred to in the paragraph above would meet their obligations, we could issue not merely a thirty-two page number but forty-eight or more.

The editor regrets that the present number of the JOURNAL has been delayed past the end of the quarter in which it was scheduled to appear, especially as this is probably the first time such delay has occurred. Responsibility for the delay does not, however, rest with him, nor can it fairly be assigned to any other single individual or agency. It was the result of a number of slight delays due to different causes, and all of them more or less excusable of themselves. We trust no apology may be necessary with the next issue.

WANTED—I will pay 10 cents per sheet for any North American pteridophytes not now in my collection, or will exchange. List of desiderata sent upon application.—L. S. HOPKINS, 525 E. Main St., Kent, Ohio.

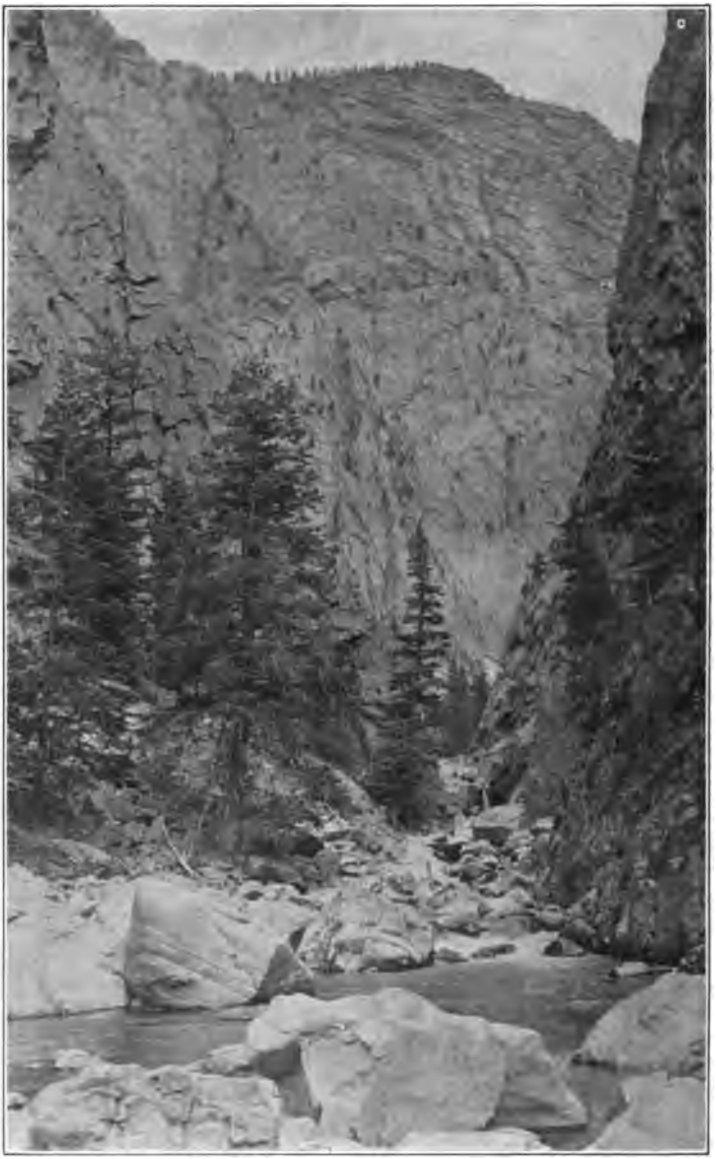

PLATE 1.—A Scene in Brazos Canyon.

American Fern Journal

Vol. 4 SEPTEMBER—NOVEMBER, 1914 **No. 4**

The Ferns of Brazos Canyon, New Mexico *

BY PAUL C. STANDLEY

Brazos Canyon is located in northern Rio Arriba County, New Mexico, eight miles east and north of the county seat, Tierra Amarilla. It is perhaps 30 miles south of the Colorado line, about half way across the State, the nearest railroad station being Chama, twenty-two miles to the north. In 1911 the writer spent ten days at Chama, for the purpose of collecting plants, and in August and September, 1914, in company with Mr. H. C. Bollman, he camped for four weeks along the Brazos River, near the mouth of the canyon proper. Although the camping expedition was primarily a vacation trip, a large collection of plants was secured, several of which were not known previously from the State. The most interesting group in the region is the ferns. During recent years large collections of plants have been made in many parts of New Mexico, and since most collectors pay particular attention to ferns a large number are known to occur in the State. Consequently, the writer was much surprised to find two additions to the fern flora.

The Rio Brazos is a good-sized mountain stream of clear, cold water, which dashes down over great boulders,

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[No. 2 of the JOURNAL (4: 41-76) was issued June 9, 1914.]

forming here and there deep, dark green pools, and finally reaching the valley of the Chama River, where it becomes slower and shallow. For most of its course it traverses a high plateau, through which it has cut a deep, narrow gorge, in some places not more than a hundred yards wide, bounded by vertical cliffs from two to three thousand feet high. Viewed from a short distance the cliffs appear nearly bare of vegetation, aside from the scattered spruces that have gained a precarious footing in earth-filled crevices, but a closer inspection shows them covered with small lichens, whose colors take on intenser hues in wet weather and produce a conspicuous change in the coloration of the rocks. Narrow crevices in these rocks are a favorite habitat of several ferns. The summits of the cliffs and their basal slopes, where the canyon widens, support a heavy plant growth which can be readily divided into two life zones. The "box" of the canyon proper, the higher slopes of the mountains, as well as their northern slopes at lower levels, and the banks of the streams, are densely covered with vegetation characteristic of the Canadian Zone. The trees here are the Rocky Mountain white pine (*Pinus flexilis*), Colorado blue spruce (*Picea Parryana*), Douglas spruce (*Pseudotsuga mucronata*), white fir (*Abies concolor*), and aspen (*Populus aurea*). The plant life of the lower slopes and of the great rock slides at the base of the cliffs is typical of the Transition Zone. The only tree is the Rocky Mountain yellow pine (*Pinus brachyptera*), except along the streams, whose banks are fringed with the mountain cottonwood (*Populus angustifolia*). Beneath the pines there is usually a thick shrubby undergrowth, composed chiefly of deciduous scrub-oaks, with a preponderance locally of choke-cherry (*Padus melanocarpa*) and service-berry (*Amelanchier* sp.).

In this restricted region the writer collected the twelve species of ferns and fern allies which are enumerated below.

POLYPODIUM HESPERIUM Maxon. It is not certain that any representative of this genus has been collected before in New Mexico. There is a report of the occurrence of this species in the Sandia Mountains, east of Albuquerque; but the specimens upon which the record is based are lost, and there is a possibility that they really did not come from the State. The species is the most local of any found in the Brazos region, for it was seen in only two restricted localities. In both instances it grew in crevices on the under side of large granitic rocks, on a northward slope among firs and aspens. But two small cliffs were inhabited by the plants, which were sufficient for only a few sheets of specimens. The species is local in Arizona, and in Rydberg's Flora of Colorado only a single locality is reported for that State, a station near Ouray, approximately one hundred and twenty-five miles northwest of the one in New Mexico. In the United States National Herbarium, however, there is another sheet of somewhat depauperate specimens, apparently referable here, collected at Twin Lakes, in central Colorado, by John Wolf.

The New Mexican specimens are quite uniform in the size and form of the fronds, which are very narrow, with narrow segments. They are not exactly matched by any others in the National Herbarium and may represent an undescribed species. In some respects they resemble the form of *Polypodium hesperium* described from Arizona by Mr. Clute as *P. vulgare perpusillum*, but their fronds and segments are still narrower.

DRYOPTERIS FILIX–MAS (L.) Schott. This species is not common in the State, although it extends as far south as the Organ Mountains, near the Texan border. In Brazos Canyon it is rather abundant, less so, however, than *Athyrium*. Most frequently it grows in crevices of rocks, in damp shady spots along small brooks. It occurs in many places along the cliffs inside the "box," and it grew on one of the cliffs with the *Polypodium*.

WOODSIA SCOPULINA D. C. Eaton. Upon the summits of rocks, usually in exposed places, this species is common. Where they are exposed to the direct rays of the sun the plants are dwarfed, but in protected situations they attain a height of 18 cm.

WOODSIA MEXICANA Fée. On a shaded cliff a form which differs somewhat from the typical one, but referred here for the present, was collected. *Woodsia mexicana*, so-called, is the common Woodsia of the State.

FILIX FRAGILIS (L.) Underw. Although one of the two commest ferns of New Mexico, this is infrequent along the Brazos. It was seen in only a few localities, usually drooping from crevices of cliffs. The fronds were unusually large and finely dissected.

PTERIDIUM AQUILINUM PUBESCENS Underw. This and *Filix fragilis* are the most abundant and widely distributed ferns of New Mexico, being found in all the higher mountain ranges. The bracken thrives best among the aspens of the Canadian Zone, but now and then it intrudes among the yellow pines. From a distance the large patches, turning bright yellow in September like the aspens, were a conspicuous feature of the hillsides. Many of the fronds were infested with what appeared to be a fungus.

CRYPTOGRAMMA ACROSTICHOIDES R. Br. One of the most widely distributed of endemic western ferns, the parsley fern probably reaches the southeastern limit of its range in Rio Arriba County. Although it is very abundant about the Brazos Canyon, it had never been collected in New Mexico before, and probably within

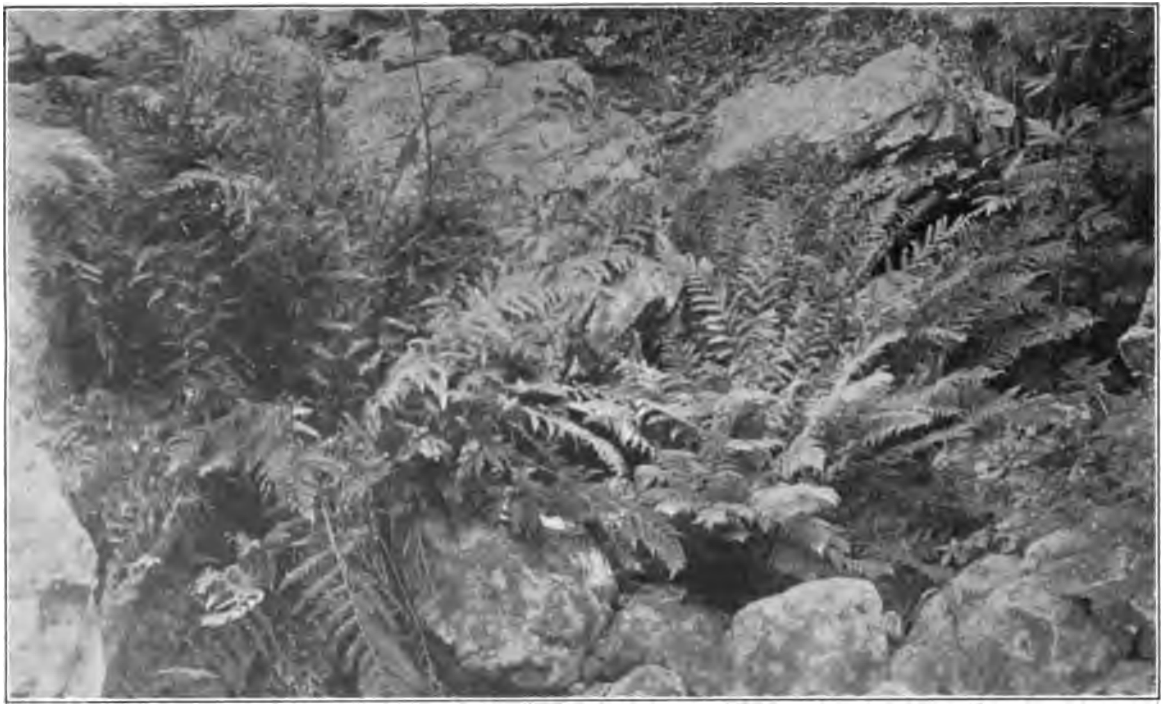

PLATE 2.—*Athyrium cyclosorum* along a small brook. The clumps are 4 to 6 feet in diameter.

the State it is restricted to this mass of mountains. The writer discovered it first on cliffs just at the mouth of the canyon. Later it was found in many places inside the canyon and on the rock slides higher up. It grows usually in the shade of rocks, but in protected places it thrives in moist gravelly soil. The plants vary greatly in size, according to insolation and available moisture.

ASPLENIUM TRICHOMANES L. A few plants were found in two localities, in both instances on moist shaded cliffs.

ATHYRIUM CYCLOSORUM Rupr. Nowhere else in New Mexico, probably, is this fern so abundant as here. It reaches the largest size of any fern in the State, some of the fronds being over four feet long. On the upper Pecos River, east of Santa Fe, in 1908, the writer, in three months' collecting, found only a single small clump of the plants. Here in Brazos Canyon along the small brooks they were everywhere, furnishing in some places the most conspicuous element of the herbaceous vegetation. Great masses of the fronds, three to four feet high, intermingled with *Rudbeckia laciniata*, *Aralia bicrenata*, and *Aconitum*, lined the banks of the brooks, forming a beautiful picture. The tall, heavily fruited fronds are found in the large clumps; small and probably younger plants growing with them have shorter fronds, although these too are fertile.

ASPLENIUM SEPTENTRIONALE L. It was a pleasant surprise to come upon this peculiar little fern, even though it was not new to the State flora. While it has a wide range in the western United States and in Europe, it appears to have a decidedly local distribution, in America at least. In 1911, the writer found a few plants on the under side of a rock near the base of the

Sierra Grande in the northeast corner of New Mexico. In the Brazos Canyon the species is fairly abundant, if one takes the pains to look for it. The grasslike fronds in crowded masses are so little suggestive of a fern that one is likely to pass them by, though once distinguished they cannot be confused with any other plant. The plants occur in narrow crevices of the rocks, either on the under side in shade or on the upper side in the fierce glare of the sun. So well down do their roots extend into the crevices that it is almost impossible to dig the plants out intact. The dead fronds persist for a long time.

EQUISETUM ARVENSE L. Almost anywhere along the Rio Brazos this species is abundant, and the bright green vegetative stems are a conspicuous feature in the sandy soil at the edge of the water. In August and September the fertile stems had withered, but everywhere in the moss about the vegetative stems were the sharp-pointed buds which were to develop into fruiting stems the next season. Another species of *Equisetum* with stout, simple, perennial stems was noticed in several places, along with *E. arvense,* but as it was not in fruit it was not collected. Probably it was *E. laevigatum.*

SELAGINELLA UNDERWOODII Hieron. In a single locality, upon the northward face of a cliff, a few mats of this plant were found. In habit and general appearance it bears more resemblance to a moss than do our other New Mexican species. It is far from rare in the State, especially in the Santa Fe and Las Vegas Mountains. It was described from specimens collected by Fendler, in 1847, in the mountains near Santa Fe.

UNITED STATES NATIONAL MUSEUM,
Washington, D. C.

Notes on the ferns of the Champlain Valley

SIDNEY F. BLAKE

Three years ago, during the summer of 1911, I spent six weeks botanizing in the Champlain Valley of Vermont, collecting not only pteridophytes, but phanerogams as well. Although records of the more important species have already been published in Rhodora (XV. 158–163, 200–201 (1913); XVI. 38–41 (1914)), my friend, Mr. Harold G. Rugg, has suggested that notes on the fernworts collected might prove of interest to readers of the JOURNAL. In the following notes I have accordingly included records of all the species collected, rare or common. My first month, from July to mid-August, was spent at Essex Junction, a railroad junction near Burlington, of some local fame as the scene of frequent railway accidents, and the rest of the time at Swanton, a small town about four miles below the Canadian border. Both towns are situated on large sandy deltas formed in glacial and slightly post-glacial times by the Winooski and Mississquoi Rivers, and deposits of limestone or marble with their characteristic species occur in both localities.

A number of ferns, common enough at both places as they are nearly everywhere in the East, may be dismissed with a mere listing of their names. These are *Adiantum pedatum, Dryopteris cristata, D. marginalis, D. spinulosa, D. spinulosa* var. *intermedia, D. Thelypteris, Asplenium filix-femina, A. Trichomanes, Cystopteris fragilis, Onoclea sensibilis, O. Struthiopteris, Polypodium vulgare* (collected at 4000 ft. on Mt. Mansfield), *Polystichum acrostichoides, Pteris aquilina, Woodsia ilvensis, Osmunda Claytoniana,* and *O. regalis. Dryopteris Boottii, D. cristata* var. *Clintoniana,* and the splendid *D. Goldiana* were found once or twice at both localities. On a rich wooded hillside on Aldis Hill, St. Albans, the last two were found, growing with the only plant of *Asplenium angustifolium* I have ever met with. *Asplenium acrostichoides,* which seems to be not common in northern Vermont, also grew with the last three species and was found once at Williston. Among the limestone lovers I was pleased to find *Camptosorus rhizophyllus* and *Pellaea atropurpurea* var. *Bushii* Mackenzie at Ethen Allen Park, Burlington. *P. atropurpurea* var. *Bushii,* not before recorded from Vermont, but collected probably by Faxon at Burlington many years ago, should be looked for elsewhere in the state. It differs in its very smooth stipes and raches from the chaffy-hairy typical forms. *Camptosorus* was seen on two or three occasions afterward both in the Burlington region and at Swanton, and true *P. atropurpurea,* with the other calciphiles, *Cystopteris bulbifera* and the pretty little wall-rue (*Asplenium Ruta-muraria*), was collected on the limestone ledges at Winooski forge. The three oak-ferns—*Phegopteris Dryopteris, P. hexagonoptera,* and *P. polypodioides*—were found at or near Essex Junction, but only *P. polypodioides* at Swanton, where the rich woods favored by these species are less common.

In Rhodora, for September, 1913 (XV. 154–156), a synopsis was given of the seven forms of the cinnamon fern which seem worthy of distinction, the substance of which may be repeated here. Typical *O. cinnamomea,* with rounded or subacutish *entire* pinnules, crowded or subremote, ranges from Newfoundland to Florida, west to Illinois and Louisiana, or probably further. It includes forma *angusta* Clute, which at least as to the only authentic specimen seen seems a mere state with somewhat revolute pinnules, not worthy of separation. I have not infrequently found a similar state in swampy spots where the trees had recently been felled. Var. *glandulosa* Waters, which was retained as a variety rather than a forma out of deference to its somewhat stronger characters and apparently definite, although limited range, has the pinnules. which are likewise entire, glandular-pubescent. as well as the upper part of the rachis. The next four forms have some or all of the pinnules toothed, lobed or crenulate, and are usually best developed in deep, rich, shady woods. Forma *incisa* (Huntington) Gilbert has many of the pinnules particularly towards the middle of the pinnae sharply toothed and when extreme is the handsomest form of the species. Included in this is var. *auriculata* Hopkins, a plant which in its often greatly enlarged basal pinnules, shows an approach to the next form, but which on account of their acute dentations seems better referred here. Forma *bipinnatifida* Clute, of which f. *trifolia* Clute is merely a lesser development, has bluntly lobed pinnules, with the lobing most conspicuous toward the base of the pinnae, the lowest pinnules being often much elongated. The new forma *latipinnula* Blake has very thin oblong or almost deltoid pinnules, 1 cm. wide, 1.5–2 cm. long, with crenulate or slightly lobulate margin. The type comes from Stoughton, Massachusetts, and I have seen it also from Walpole, and from Swanton, Vermont. The peculiar forma *cornucopiafolia* Clute, described and figured in Fern Bulletin XVI. 108–109 (1908), has the costa of the pinnae naked for some distance near the tip, and many of the pinnules, some of which are lobed, bear ascidia on naked veinlets from the under surface. Finally the well-known forma *frondosa* (Torr. & Gray) Britton, generally quoted as var. *frondosa* Gray, has the fruiting pinnae partly foliaceous. During 1912, I found an abundance of this form in the vicinity of Stoughton, and while it was often met with in burnt-over ground, quite as often it occurred in meadows or pastures where there was no evidence of recent fires. On one occasion, in 1908, I found the same form in a white cedar swamp in Canton, where also no obvious cause for this deviation was evident.

Of these forms, *O. cinnamomea* (typical) is common in Vermont; f. *incisa* I have seen from several station; f. *bipinnatifida*, which I collected in a pasture in Williston seems to be new to the state; f. *latipinnula* is so far known only from Swanton; and f. *frondosa* from a few stations in Vermont.

A peculiar form of *O. regalis*, f. *interrupta* Milde, with fronds fertile in the middle was collected at Swanton on one occasion. It seems to be due to second growth after the first fronds have been destroyed by mowing.

Of the grape-ferns, *Botrychium obliquum*, with a form approaching var. *dissectum*, *B. ternatum* var. *intermedium*, and *B. virginianum* were collected, and a colony of the adders-tongue with many of the fronds paired from the rootstocks was found in a pasture at Essex Junction.

Equisetum arvense, *E. fluviatile*, *E. hyemale* var. *affine*, and *E. sylvaticum* were common everywhere, and *E. scirpoides* uncommon. The scarce species, *E. palustre*, was twice collected in Colchester, and *E. hyemale* var. *affine* forma *polystachyum* Prager, a form with many sessile spikes from the upper nodes, was found once in sandy soil at Burlington. *E. variegatum* var. *Jesupi*, a very handsome plant as it grew in tufts among the rocks along the Winooski, with its trim black-and-white-and-green-striped spikes, then in young fruit, was found somewhat abundantly along the shores of the Winooski River at Essex Junction, and sparingly in Burlington and South Burlington. Among the thousands of individuals along the shores of the Winooski occurred two variant forms, one of which, with one or two supernumerary spikes from the topmost nodes, I have described as f. *geminatum*, while the other, whose fertile stems bear from two to eight long many-jointed branches, often fruitful at the tips, I have called forma *multirameum*.

Among lycopods *L. clavatum*, *L. complanatum* var. *flabelliforme*, *L. inundatum*, *L. lucidulum*, and *L. obscurum* with its var. *dendroideum* occurred at both localities. *L. clavatum* var. *megastachyon* was found at Essex and on Mt. Mansfield, *L. tristachyum* at Burlington and Fairfield, and *L. Selago* at 3950 feet on Mt. Mansfield. The only selaginella of the region is *S. rupestris*, which was collected at Cobbehill, Milton, and at Prospect Hill, St. Albans, where it formed large mats on exposed ledges at 800 feet.

PARIS, FRANCE.

Fern nomenclature

CHAS. T. DRUERY, V. M. H., F. L. S.

From the point of view of the English Fern students, the fern nomenclature adopted in the AMERICAN FERN JOURNAL affords ample evidence of the terrible haste which the scientific botanists have made in the course of their research regarding the original names given by the older botanists with the result of resurrections thereof (i. e. of the names, not the botanists), and the increased puzzlement of the fernists of the present day due to the changes involved. In many cases this involves a sort of translation from one language into another which between otherwise English-speaking nations is an absurdity. I, for instance, am familiar with certain common ferns, which are popularly called buckler ferns and scientifically here *Lastrea*, or better still, *Nephrodium*, this latter name indicating the kidney-shaped form of the indusium, which the word buckler, as distinct from shield, does also to an accepted extent. In the States, however, instead of these I find frequent mention of *Dryopteris* as the accepted synonym, which merely means oak fern, an obvious absurdity, as the genus is practically ubiquitous, and I only recognize familiar friends when I see them figured in association. Looking further into the matter (p. 18) I find *Dryopteris* = *Polystichum* in parenthesis, an altogether different genus, which we call shield ferns, from the circular form of the indusium, but which is further distinctly characterized by a peculiar form of the pinnule or secondary (or tertiary) division. See for instance the illustrations of plates 9 and 10 and compare with plates 12 and 13, which clearly show the difference which is enhanced by the very different texture of the fronds and their lucent or non-lucent surface. No grower of the two genera could class them as one, yet as a heading to p. 7, *Dryopteris*=*Aspidium* (shield fern) emphasizing the reference already made (p. 18). On p. 19 we have repeated the old absurdity of classing *Athyrium filix-foemina* with the asplenia, to my mind one of the most absurd allocations imaginable, since the asplenium fructification is linear, they are evergreen, of tough texture, grow mostly on rocks and in short differ in every respect from the soft-fronded, deciduous, moisture-loving *Athyrium*, with its indefinite horse-shoe sori and ragged indusium, etc., etc. In my humble opinion a vast proportion of this exhuming botanical work with a view to reformation of the existing nomenclature is simply a waste of time and energy and only contributes to increase the confusion they aim at clearing up. There should be a statute of limitations imposed and more consideration given to the ideas of the cultivation of living plants than to the literally dry-as-dust data afforded by herbaria only. Why accept the ancient authorities as determining ones when the knowledge and material at their disposal was necessarily scanty and incomplete? In our old British fern literature, for instance, great as is the debt we owe to the pioneers of that day, we find that hardly a single name is retained nowadays, subsequent experience having displayed their inaccuracy and led to correction.

What is the Habitat of Ophioglossum vulgatum

R. C. BENEDICT

There seems to be some difference in opinion as to the usual habitat of *Ophioglossum vulgatum*. Note the two following references to it which have appeared in the FERN JOURNAL in the last few numbers.

"*Ophioglossum vulgatum* I have found several times, usually in dryish soil. It seems to like the shade of *Pteris*, and is probably not rare, but it is so slender that it is frequently overlooked."[1]

"From the description given above, it will be noted that the situation was not dissimilar to that required by *Ophioglossum*—indeed the latter occurred there—and it is not unlikely that careful search in *Ophioglossum* territory may reveal more localities for *Schizaea*."[2]

The latter statement brought a query from a member of the Society who is familiar with the flora of southern New Jersey, and who stated that the usual habitat for *Ophioglossum* in southern New Jersey was in the pine barrens, and that the locality as described by me above was most unusual. As it happened that I was there for *Schizaea*, and the *Ophioglossum* was not fertile, I did not collect any, particularly as the situation was not in any important respect different from the places in which I had already found *Ophioglossum*. But Mr. Knowlton's description of the *Ophioglossum* habitat shows it to be in Maine decidedly unlike those I am familiar with. Can we not have a symposium here in the Journal on the habitat of *Ophioglossum*? I would ask that all who have found the adder's tongue send in a statement of the localities in which they have found it. These statements should include a resume of the facts regarding the soil, dampness, associated plants, and exposure, or any others of importance. It will not be necessary to put the facts in form for publication, as it may be necessary if a large number respond, to summarize the replies anyway. One point will be of particular interest in connection with a fact noted by Prof. Campbell in his monograph on the *Ophioglossaceae.* He records the finding of at least most of the prothallia studied in locations where it was evident that the ground was subject to flooding at some period of the year. In this connection Mr. Webb's description of the habitat of *O. Engelmanii* in Missouri is interesting. Below I present a record of the localities in which I have found *Ophioglossum.*

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[1] C. H. Knowlton, Ferns and their Allies in Southern Franklin County, Maine. Am. Fern Jour. 4:5. 1914.

[2] American Fern Journal 3: 13. 1913.

1. Orange, New Jersey. Low flat sedgy meadow, dry at that time, early July, but probably wet after any hard rain; no shade. *Sphagnum* occured in small patches for some time in the field.

2. Cornwall, Connecticut. Low, wet, boggy meadow; no shade; *Sphagnum* present; soil mucky.

3. Toms River, New Jersey. Low swamp; sandy soil; *Sphagnum* present in patches; the *Ophioglossum* occurred at the edge of a thicket, partly shaded.

4. Springside, Hackensack River Valley, N. J. Wet, sedgy, swamp meadow, probably dry later in the summer. Similar to the Cornwall station described above although no *Sphagnum* appeared to be present. This station was discovered this spring by Dr. A. B. Stout, of the New York Botanical Garden. It contains many thousands of plants. Probably all along the Hackensack meadows similar stations occur.

The four situations are essentially the same in that all represent more or less boggy conditions favored by *Sphagnum.* Where have you found the adder's tongue?

BROOKLYN, N. Y.

Mr. Druery on Fern Nomenclature and on the Collection of Ferns for Herbarium Purposes

R. C. BENEDICT

Mr. Druery's notes on fern nomenclature, on another page, call for some explanation, since they seem to indicate that he believes the FERN JOURNAL has an "official" fern nomenclature. He speaks of the "nomenclature adopted by the AMERICAN FERN JOURNAL." This should be expressed "the nomenclature adopted by the writers in the AMERICAN FERN JOURNAL," since the first principle of the JOURNAL has always been that contributors are always free to use any nomenclature they may perfer as long as they adopt one consistently. As a matter of fact, the editor is partial to the name *Dryopteris*, but the managing editor and the elected officers would probably all favor *Aspidium*, and undoubtedly votes would still be cast for *Nephrodium* if the matter were submitted to the vote of the Society.

Mr. Druery favors *Nephrodium* because this name bears directly on the kidney shaped indusia characteristic of most of the species of this genus, but he notes *Lastraea* as the accepted name in England. Is not this itself an illustration of the practice to which he makes objection, the use of superfluous names "to the puzzlement of fernists"? The use of scientific names which have direct application to the genus in question, however ideal it might seem, is unfortunately a counsel of perfection. If it were to be followed to its logical conclusion in the realm of nomenclature, it would mean so wholesale a revision of existing names that the changes incident to the adoption of the modern rules based on priority would fade in insignificance.

Besides his reference to the present difference of opinion as regards the proper name for shield ferns in England, Mr. Druery affords another illuminating hint as to one of the principal reasons for the development of the modern system of nomenclature in the following sentence: "In our old British fern literature .... we find that hardly a single name is retained nowadays, subsequent experience having displayed their inaccuracy and led to correction." This is exactly the *raison d'etre* for the modern system as exemplified in the codes adopted at Vienna and Brussels, i. e., the correction of inaccuracies of the previous system or lack of system of nomenclature. The fact that the scientists of practically all nations are meeting periodically and are finding more and more common ground on which all can agree gives assurance that we are approaching the unanimity of usage which is to be desired.

In the matter of the collection of ferns for herbarium purposes, comment is called for because of Mr. Druery's article published in the January number for 1914. Mr. Druery refers to a specific case of herbarium collecting as "another act of vandalism," the implication being that acts of vandalism are frequent in America.

From Mr. Druery's standpoint it may be that many of us are too careless about preserving plants in a living state, and too anxious to have many different forms represented in our herbaria. His criticism, however, does not take into consideration the very different conditions under which fern study is carried on in this country as compared with those of England. When these conditions are borne in mind, there appears to be very little basis for his charge.

The criticism implies that an American collector always has the choice betweed collecting any particular plant for his herbarium or for a fern garden. The facts are, however, very different. Fern gardens are infrequent with us, partly because a smaller proportion of people have space or inclination for a garden, and because fern culture is much more difficult here than in

England. The average collector has to choose not between pressing the fern and growing it, but between pressing it and leaving it with considerable chance at times that it may not be there when he returns. The reclaiming of land for cultivation, or for dwellings, or the trampling of cattle are frequent causes of the disappearance of all sorts of wild treasures. The transplanting of ferns liable to destruction in this manner would not necessarily save them, for back-yard culture of ferns is seldom successful unless special pains are taken to transplant also large amounts of soil at the same time, and even with this precaution failures are numerous.

Certainly it is much to be regretted that more members of the Fern Society are not interested in fern growing here in America, and it is to be hoped that all who have facilities will work to develop collections of living ferns and will make themselves known so that other less fortunate members may know where they can send living plants with a reasonable chance that they will be preserved. It should be most strongly emphasized, however, that any indiscriminate criticism, especially as regards any specific herbarium collection, is entirely without justification. Charges of vandalism should not be made unless backed by detailed proofs.

American Fern Society

Changed address: Fermen L. Pickett, Pullman, Washington. Prof. S. Fred Prince, Notch, Stone Co., Mo.

New Members: Franklin A. Barnes, Bellona, Yates Co., N. Y.; Major Herman Burgin, U. S. A., 63 West Chelten Ave., Germantown, Pa.; Mrs. Ethelwyn F. Merrill, Northwood Narrows, N. H.

By order of the Council, a full set of the FERN JOURNAL has been deposited with the Secretary and will be loaned to members on request and payment of postage, in the same manner as the specimens in the Society herbarium. The first three volumes of the JOURNAL have been bound together and weigh, when packed for mailing, about two and one-half pounds. It is hoped that this lending set will be, as time goes on, an increasing convenience to recent members who do not have the earlier numbers. Perhaps it may also serve to suggest to them the desirability of owning a set.

At present, the Society possesses only one number of its former organ, the Fern Bulletin—and that one it owes to the generosity of Miss Mirick. It is desirable that we should have a full set, as a matter of record. If any member knows of an opportunity to acquire one, the Secretary will be grateful for information about it.

In accordance with the requirements of our present constitution I immediately upon its adoption appointed a committee to nominate candidates for officers for the Society for 1915. The committee appointed was Mr. Robert A. Ware, Boston, Mass., Dr. D. W. Fellows, Portlant, Maine, and Mr. H. G. Rugg, Hanover, N. H. As soon as the list of nominations was received from this committee it was given to the secretary for printing and mailing to all members. Miss Pauline Kaufman, New York City, was appointed judge of elections to whom votes were to be sent.

C. H. BISSELL, *President.*

REPORT OF THE JUDGE OF ELECTIONS.

To the Secretary of the American Fern Society:

The undersigned, Judge of Elections by appointment of President Charles H. Bissell, respectfully presents the following report of the ballotting for officers of the American Fern Society for 1915:

Whole number of ballots....................81

For President		*For Secretary*	
Mr. Chas. H. Bissell	58	Mr. Chas. A. Weatherby	56
Prof. A. Vincent Osmun	23	Mr. Stewart H. Burnham	25
For Vice-president		*For Treasurer*	
Rev. John Davis	55	Mr. Fred G. Floyd	56
Mr. Harold W. Pretz	25	Mr. J. C. Underwood	24
Miss Nellie Mirick	1		

I therefore declare the elction of Mr. Chas. H. Bissell as President, Rev. John Davis as Vice-president, Mr. Chas. A. Weatherby as Secretary, and Mr. Fred G. Floyd as Treasurer, of the American Fern Society for 1915.

PAULINE KAUFMAN.

No. 173 East 124th St., New York City.
Nov. 1, 1914.

American Fern Society Meeting

A meeting of the American Fern Society will be held at Philadelphia on December 28th and 29th, 1914, at the Academy of Natural Sciences, 1900 Race Street. The exercises will open on Monday December 29th, at 8:00 o'clock, p. m., with a paper by Mr. P. C. Standley, on "The Ferns of New Mexico," followed by a symposium on "Fern Hybrids," led by Mr. Bissell and others and illustrated by specimens from the Society and private herbaria. Members are urged to meet for dinner at six o'clock at the Bourse Building Restaurant, eighth floor, corner of Fifth and Chestnut Streets, on Monday evening the 28th. On Tuesday, December 29th, at 10:00 a. m., will be an exhibit of specimens with talks on local ferns by members of the society. It is planned to have on exhibition specimens of as many as possible of the new species, and forms that have recently been described in the JOURNAL. Any members having specimens of new or rare things that they are willing to loan the Society for exhibition are requested to send them to Mr. James G. Scott, 123 West Price Street, Germantown, Pa., who, as chairman of the local committee of arrangements, will care for the specimens and look out for their proper return. The opportunity to meet other members of our Society in this way comes so seldom that it is hoped all who possibly can will be in attendance.

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American Fern Journal

Vol. 5 JANUARY—MARCH, 1915 No. 1

Notes on American Ferns: IX.[1]

WILLIAM R. MAXON

A NEW NAME FOR NOTHOLAENA HOOKERI D. C. EATON.—One of the most interesting and attractive xerophilous ferns of the southwestern United States is that first described as *Notholaena candida* var. *5-fido-palmata* Hook.,[2] but known since 1879 as *Notholaena Hookeri* D. C. Eaton.[3] The latter name, having, however, been given to another fern[4] more than twenty years previously by Lowe, with an adequate description and a very excellent figure,[5] its use by Eaton for the United States plant can not be regarded as admissible. As a substitute for Eaton's name the writer proposes the name **Notholaena Standleyi** in honor of Mr. Paul C. Standley, Assistant Curator of the United States National Herbarium, who has devoted much time to field study in the Southwest and recently has collaborated with Prof. E. O. Wooton in the preparation of a comprehensive Flora of New Mexico, which will appear shortly. Eaton's type is from western Texas, but the species is commonest in Arizona and New Mexico, ranging southward well into Mexico. The reference of this species to California, by Hooker, in which Christen sen follows, is explained as erroneous by Eaton,[6] who states that the specimens actually came from La Cuesta, New Mexico.

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[1] Published by permission of the Secretary of the Smithsonian Institution. (Nos. 1–8 of this series, 1900–1911, appeared in the Fern Bulletin.

[2] Hook. Sp. Fil. 5: 111. 1864.

[3] In Wheeler, Rep. U. S. Surv. 100th Merid. 6: 308. *pl. 30.* 1879.

[4] It is apparently a form of *Pellaea nivea*, or *Notholaena nivea.*

[5] Ferns 1: 59. *pl. 13.* 1856.

[No. 3 of the JOURNAL (4: 77–108) was issued Oct. 10, 1914: No. 4 (4: 109–132) Dec. 28, 1914.]

A WESTERN EXTENSION OF RANGE FOR FILIX BULBIFERA.—There are apparently no records of the occurrence of *Filix bulbifera* from the territory west of Iowa, Missouri, and Arkansas. It has been, therefore, a matter of much interest to the writer to find in a collection of southwestern plants brought back to Washington by Mr. E. A. Goldman, of the Biological Survey, an excellent, fully matured specimen of this species from Arizona. The plant in question is not only heavily soriated, but bears also half a dozen characteristic "bulblets" at the apex of one of its fronds. It was collected at Oak Creek, eighteen miles southeast of Flagstaff, Arizona, altitude 1,625 meters, July 24, 1913, and bears Mr. Goldman's original number, 2188.

In discussing the new record with Dr. P. A. Rydberg, who was in Washington at the time the Arizona specimen was received, the writer learned of the occurrence of this species in Utah also. The specimens, which were so determined by Miss Margaret Slosson, were collected in the Elk Mountains of southeastern Utah, altitude 2,500 meters, August 1 and 2, 1911, by Dr. P. A. Rydberg and Mr. A. O. Garrett (No. 9343). They are less characteristic examples of the species than is the Arizona plant. Specimens of this collection are in the Underwood Fern Herbarium of the New York Botanical Garden and have lately been received also at the United States National Herbarium.

LYCOPODIUM INUNDATUM IN OREGON.—So far as the writer can ascertain this species has never been known farther south than Washington, on the Pacific Coast.

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[6] Ferns N. Amer. 2: 28. 1880.

It may now be reported from "meadows in the sand dune region, Coos County, Oregon." The specimens, in the National Herbarium, were collected September 8, 1912, by H. D. House (No. 5001).

THE DISTRIBUTION OF LYCOPODIUM SABINAEFOLIUM WILLD.—The characters of this species having become fairly well understood in recent years, it was to be expected that its known range would be somewhat extended and filled in. Of more than ordinary interest, however, is the receipt of excellent specimens from Dr. J. V. Haberer, collected by him (No. 2550), October 28, 1911, in the vicinity of Hinckley, Oneida County, New York, in a small ravine, in the shade of spruce and hemlock. This station, which is at the edge of the Adirondac region, seems to be a new one, the only other New York locality apparently being on Staten Island (*Buchheister*), mentioned in the seventh edition of Gray's Manual. The species is not listed by Gilbert, in his article upon the fern flora of New York State.[1]

The unfortunate confusion of this species with *L. sitchense* Rupr. makes many of the earlier records unreliable, unless substantiated by specimens, even from accessible localities, so that unusual importance attaches to records which may be regarded as authentic. In their revision of 1900 Lloyd and Underwood[2] list specimens, which they had studied, from Maine, Ontario, Vermont, and Prince Edward Island. The several Maine and Vermont records are, of course, well known and have received frequent mention in recent literature. Fernald and Wiegand[3] list it from Westfield, New Brunswick, stating that it was "previously known from the upper St. John." It has been found also in the Gaspé region of eastern Quebec by Fernald, and is reported by C. K. Dodge[4] from Keweenaw County, in the upper peninsula of Michigan, upon specimens collected by O. A. Farwell. Klugh[5] lists two Ontario localities, of Burgess and Macoun, respectively, but apparently had not seen the specimens. There are probably not many other records that are dependable. That *L. sabinaefolium* is commoner than indicated in the range mentioned seems very likely; also that it occurs, at least sparingly, throughout a wider area. It must for the present, nevertheless, be regarded as one of the rarer species of this genus.

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[1] Fern Bull. **11**: 98–105. 1903.
[2] Bull. Torrey Club **27**: 164. 1900.
[3] Rhodora **12**: 133. 1910.

[Since submitting this article for publication the writer has learned from Dr. H. D. House that the new station for *L. sabinaefolium,* based upon Dr. Haberer's specimens, is given also in the forthcoming Annual Report of the State Botanist, Albany, New York, together with other notes on Lycopodium and the description of a new species allied to *L. tristachyum* Pursh.]

Notholaena Aschenborniana and a Related New Species[1]

WILLIAM R. MAXON

In a recent article[2] the writer referred incidentally to an undescribed species of Notholaena from Mexico that had been confused with *N. Aschenborniana* Klotzsch, which is perhaps its nearest ally. A description of this new species is presented herewith:

Notholaena hyalina Maxon, sp. nov.

Plants 20 to 45 cm. high, with several rigidly erect

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[4] Fern Bull. **20:** 18. 1912.

[5] Fern Bull. **14:** 73. 1906.

[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] Amer. Fern Journ. **3**: 115. 1913.

fronds, their stipes and primary rachises very stout. Rhizome multicipital, the divisions stout, decumbent, or ascending, 1 to 3 cm. long, coarsely radicose, densely covered with closely impacted scales, these 2 to 3 mm. long, narrowly deltoid-lanceolate, long-attenuate, coal-black and opaque (or, at first, with a short broad yellowish-brown median stripe at the base), rigid, unevenly ciliate throughout, the cilia 18 to 25 on each side, rigid, unicellular, dark brown, irregularly divergent, fragile; stipes straight or nearly so, 4 to 15 cm. long, 1 to 2.2 mm. in diameter, purplish-black and sublustrous beneath a dense subfurfuraceous covering of scales, these mostly brownish-ferruginous and closely appressed, a few of them darker-margined and divergent, all conspicuously long-ciliate; lamina linear to narrowly oblanceolate-oblong, 10 to 35 cm. long, 3 to 6.5 cm. broad, acuminate, slightly narrowed at the base, subbipinnate nearly throughout, the primary rachis stout and squamulose-paleaceous like the stipe; pinnae 10 to 25 pairs below the simply pinnate apex, subopposite to alternate, the lowermost ones deltoid, 1.5 to 2 cm. long, 1 to 1.5 cm. broad, opposite, distant, those above gradually longer and closer, mostly 2 to 3.5 cm. long, 7 to 10 mm. broad, elongate-deltoid to very narrowly deltoid-oblong, with about 8 to 14 pairs of approximate to subdistant, narrowly oblong segments below the lobate acutish apex; segments crenate to crenately lobed, adnate, joined by a very narrow wing (or the large basal ones semiadnate or subsessile, pinnately lobed or deeply pinnatifid), the lobes or crenations (3 to 5 pairs) of all the segments rounded, broadest at or near the base, close, subentire. Leaf tissue thick, rigidly herbaceous, the lower surface densely tomentose-paleaceous (the scales flaccid, with thin-walled cells, and with few, very long, distant, capillary teeth), the upper side dull dark green, minutely glandular, conspicuously hispid by numerous spreading hyaline simple hairs, these few-celled, flattish, and somewhat twisted in drying; margins unaltered, the narrow line of sporangia almost wholly concealed by the dense paleaceous covering of the under surface.

Type in the United States National Herbarium, No. 50931, collected from shaded ledges at San José Pass, State of San Luis Potosí, Mexico, October 11, 1890, by C. G. Pringle (No. 3297); distributed as *Notholaena Aschenborniana* Klotzsch.

The following additional specimens of *N. hyalina* are in the United States National Herbarium:

MEXICO: A second sheet of the type collection, *Pringle* 3297. Minas de San Rafael, State of San Luis Potosí, *Purpus* 5486 (2 sheets). Puebla, State of Oaxaca, *Purpus* 4018. Las Sedas, State of Oaxaca, alt. 1800 meters, *C. L. Smith* 2012. La Palma, Jalisco, *Jones* 533.

Notholaena hyalina is related to *N. Aschenborniana* of more northerly range, with which it has been confounded on account of its general similarity. *Notholaena Aschenborniana,* however, is easily distinct, among other characters, in its strongly ascending pinnae (the basal ones never of a pronounced deltoid form), its simpler and closer segments, and particularly in the widely different, subintricate hairy covering of the upper side of the lamina, the hairs being stellate with spreading, subequal, capillary divisions. The contrast to the large simple hairs upon the upper side of the lamina of *N. hyalina* is very great.

Notholaena Aschenborniana is represented in the National Herbarium by the following specimens:

MEXICO: San Lorenzo Canyon, 6 miles southeast of Saltillo, Coahuila, *Edw. Palmer* 402, in 1904. Sierra Mojada, Coahuila, *Jones* 531. Santa Eulalia Mountains, Chihuahua, *Wilkinson; Pringle* 466, 469.

TEXAS: Vicinity of Van Horn, June, 1905, *G. H Girty.*

ARIZONA: Santa Rita Mountains, under shelter of dry rocks, May 20, 1884, *Pringle*. Exposed south slope of Mule Mountains, January 1, 1913, *Goodding* 1387.

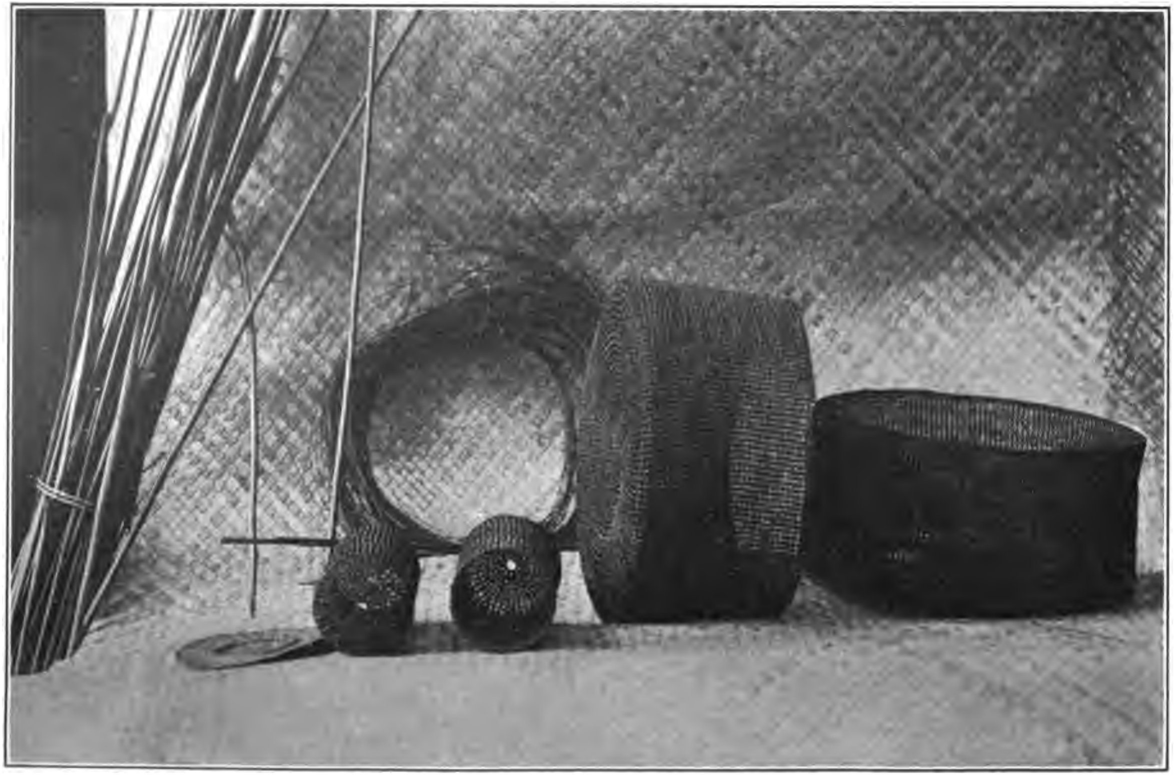
Fern Hats and Fern Cigar Cases

R. C. BENEDICT.

The title and illustration answer nearly all the purposes of description. It only remains to inform any one interested where these articles may be obtained, the proper circumstances for wearing them, and the kind of fern used and method of manufacture. I am mainly indebted for my information to Mr. Percy Wilson of the staff of the New York Botanical Garden who brought back the specimens from a collecting trip in the East Indies made over ten years ago.

The fern used is a member of the family *Gleicheniaceae*, the first record for the occurrence of which in the United States was made by Mr. Maxon in the JOURNAL last year (Vol. 4: No. 1.). The particular species used is *Dicranopteris linearis* (Burm.) Underw. The illustration shows at the left some of the long leaf stalks of this species before anything has been done with them. A little to the right of the stalks, leaning against the background (a native Javan sleeping mat made from *Pandanus*) is a coil of the fibers which have been extracted from the leafstalks preparatory to weaving them into hats, etc. The machinery used in this operation of preparing the fibers for weaving is to be seen at the left front, and consists of part of the top of a tin tomato can, with numerous holes of various sizes. The fibers are prepared for weaving by drawing them through successively smaller holes in the tin instrument until they are of a satisfactory size for weaving.

The cigar cases are designed to hold cigars, but are made mainly to sell to tourists. They would seem to



have some defects when compared with a modern humidor. The hats, Mr. Wilson tells me, are all the go for evening wear by the older men when attending dances or other festivals: at least that was the case ten years ago. They would thus appear to be analogous to our silk or opera hats. As to the kind of dances practiced or the remainder of the costume I have no information.

Fern Notes

GEO. L. MOXLEY

The season of 1914 has slipped away all too soon I have not been able to do much of what I had hoped. But now at the end I will try to gather up the fragmentary results and set them forth in some sort of order.

Early in February, I began bringing home clumps of *Adiantum Jordani*, *Gymnopteris triangularis*, and *Pellaea andromedaefolia* for my fernery. I also put some of the best plants in press. These I got from nearby hills.

On May 30, I made a trip into the San Rafael Hills, the same range visited by Prof. T. J. Fitzpatrick and myself the previous May 30, but I visited a different canyon from the one we followed. On this trip I did not find so many species of ferns as we did the previous year, but those I found were more plentiful. The species included *Pellaea ornithopus*, Hook., *Dryopteris rigida arguta*, (Kaulf.) Unde., *Adiantum Jordani*, C. Muel., *Polypodium californicum*, Kaulf., *Cheilanthes Californica*, (Nutt.) Mett., *Gymnopteris triangularis*, (Kaulf.) Unde.

On September 3 I visited another part of the same range of hills and found *Cheilanthes californica* still growing in some of the shaded ravines in spite of the dryness of the late season. Also noted *Dryopteris* *rigida arguta* and some dried up plants of *Gymnopteris triangularis.*

September 5–7, in company with my son, I went into the San Gabriel Mountains. In the Arroyo Seco Canyon we found *Adiantum capillus-veneris* L. growing on wet shaded banks at elevations from about 1800 to 3000 feet. In a cleft of a rocky cliff, at about 3000 feet, I found a pretty dry plant that I take to be *Cheilanthes Fendleri*, Hook., though it may be *C. Clevelandii*, D. C. Eaton. *Dryopteris rigida arguta* was plentiful on the shaded slopes and there was some *Polystichum munitum*, (Kaulf.) Unde. in the higher altitudes.

I have given several spare hours to classifying and cataloguing the ferns in the Herbarium of the Southern California Academy of Sciences, a self-imposed task which, although not yet completed, has given me much pleasure. There are something near 200 sheets of ferns and fern allies from various parts of he world. Quite a large number of them are from Scotland, where they were collected by Dr. A. Davidson, chairman of the Botanical Section of the Academy. Then there are several from Germany, Mexico, and various parts of the United States collected by Dr. Chas. Mohr, at one time State Botanist of Alabama, and two of his nieces, who reside in this city. The rest have been collected by many different persons and the whole forms a quite interesting collection.

While I have not been able to visit some of the places I had hoped to, and have not found some of the ferns I wished to, on the whole I have had a good time and look next year for perhaps a better.

LOS ANGELES, CAL.,
October 1, 1914.

Notes and News

PROTHALLIA OF CAMPTOSORUS

Readers of the JOURNAL have not found much in its pages about the prothallial stage of any sort of fern. A reference to a paper on this stage of fern life may therefore be of interest, especially as it deals with the prothallia of one of our most interesting and less common species, the walking fern.

Under the title "Resistance of the prothallia of *Camptosorus rhizophyllus* to dessication,"[1] F. L. Pickett discusses a series of experiments carried on with the prothallia of this fern which go a long way toward explaining the ability of the walking fern to grow and thrive in situations frequently subject to extreme drouth. These experiments are also suggestive as regards the maintenance of other ferns which frequent dry situations like *Pellaea atropurpurea*, which seems often to like best the most exposed cliffs.

Briefly the experiments were as follows: Prothallia of this species were grown from spores and then were subjected to periods of artificial drying, varying from a few days up to two months. It was found that vigorous prothallia could stand continous drying of more than two months and still be able to resume growth and to produce the sporophyte stage when moisture was again applied. A difference was noted however, as regards the behavior of the prothallia in direct sunlight and in diffused light, the latter being much more favorable.

Some of the details noted incidentally are also of interest. For example, spores taken from leaves collected October 26th, and sown November 22nd, germinated by December 17th. Under normal moist conditions those in direct sunlight showed more rapid growth at this time than those in diffused light. It was found that the spores of this species germinate irregularly. Thus a sowing of spores examined twelve weeks after sowing showed all stages from mature prothallia down to spores just germinating. Also leaves collected in March furnished spores which germinated well in cultures.

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[1] Bull Torrey Club **40:** 641-645. 15 Nov. 1913.

It may be noted finally that the writer of the article under review has further experiments of the same sort now under way and would undoubtedly appreciate the sending of spore-bearing leaves of any ferns frequenting dry situations, of Pellaeas, species of Cheilanthes, and any others. Such specimens may be sent to him at Pullman, Wash.

R. C. B.

NOTES ON ISOËTES

During the spring of 1909, I collected some Isoëtes in a small, artificial pond, back of Stanford University, University, California.

With some other ferns, I sent a sheet of this Isoëtes to the Society Herbarium. Mr. Hopkins was interested in the plant and I sent all the material I had to him. The specimens were collected too early to be in the best condition, but after a careful study of the plants, Mr. Hopkins gives the following data:

Number of plants examined, 17. Number of leaves per plant, 17; largest number on one plant, 30; smallest number, 8. Length of leaves, 4–15 inches. Stomata abundant in the upper 2-3 of the leaf. Velum small, covering ¼ or less of sporangium. Plants monecious, microspores not plentiful, in fact, they were found in one sporangium only of the three plants whose spores were examined. Peripheral bundles present and seemingly variable. Trunk distinctly bilobed. Macrospores 368, 386, 368, 368, 368, 504, 386, 386, 368, 522, microns. Microspores 28, 26, 30, 24, 24, 28, 24, 24, 24, 24, 24, 24, 26, 28, 28, 26, 25, microns.

ISOETES ENGELMANNI A. Br.

The artificial pond, "Mud Lake," is one used for irrigation purposes so the level is not constant. The plants when collected were growing under several inches of water—a few of the plants having their tips near the surface. An attempt to get more of this plant will be made the coming summer.

The Polystichums listed from Noyo River and Mt. Shasta, have been presenting a good many questions to me, and to gain assistance in answering these questions I have sent the entire lot to Mr. Hopkins. He says, "the material is certainly very interesting and I have been looking at it with longing eyes for some time."

H. H. TRACY.

NOTES ON MAINE FERNS

I find it interesting, in connection with Mr. Knowlton's list,[1] to recall some collecting experiences of ten years ago in Auburn. Me. Auburn is in Androscoggin County, which touches Franklin on the south. Being nearer the coast it lacks several northern and mountain species such as *Polystichum Braunii*, *Aspidium Goldianum*, and *Lycopodium sabinaefolium*. Perhaps the fact that I did not find *Woodwardia virginica* and *Lycopodium inundatum* is accounted for by the rather narrow range of my explorations. I had one good station for *Phegopteris hexagonoptera*, one for *Asplenium platyneuron*, one or two for *Selaginella rupestris*, and several for *Asplenium Trichomanes* and *Woodsia ilvensis*.

One plant of frequent occurrence in Auburn surely will some day be added to the Franklin County list. That is *Botrychium simplex*. It was found in pastures and sterile fields, usually associated with *B. ramosum*.

Sixty miles west of Franklin County, in Vermont is a region much like the Farmington country where

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[1] FERN JOURNAL 4. 57.

Athyrium angustifolium is an occasional inhabitant of the rich woods. It would interest me to hear a good reason why this fern that is scattered all the way from Missouri should reach a sudden limit in northeastern Vermont.

AUBURNDALE, MASS. E. J. WINSLOW.

NOTE ON EATON'S FERNS OF NORTH AMERICA

From correspondence it has been discovered that not a few copies of Eaton's Ferns of North America are imperfect. Some have one or more plates lacking, while others have duplicate plates. This note is published to give members and others owning copies of this work an opportunity to perfect them. Look the plates over carefully, they are not always arranged in numerical order, and see if you have them all and if you have duplicates of any of them. There should be 81. Drop me a line and let me know the result of your investigation. If your copy is perfect I should be glad to know it. If you need any plate or plates give me the numbers and if you have duplicates tell me how much you will sell them for. In this way it is hoped that some of us may be able to obtain missing plates and perfect our copies.

FRED G. FLOYD.

325 PARK ST., WEST ROXBURY, MASS.

THE FERN AS A STATE FLORAL EMBLEM

Unlike many foreign countries, the United States has no universally recognized floral emblem, although some of the States have legally adopted certain flowers and others have attempted unsuccessfully to do so. The latest State to agitate the question is Pennsylvania, where a bill to make the daisy the state flower was last year vetoed by the Governor. Since that time one of our members, Mr. J. G. Scott, has been actively engaged in a campaign to have "The Fern" legally created the state emblem. In spite of many good arguments in its favor, this proposition has been opposed by various citizens who prefer the mountain laurel, and seems to have met defeat in the first encounter, the House of Representatives having recently passed a bill naming the laurel as the state flower.

American Fern Society

MANILA, P. I., SEPTEMBER 12, 1914.

MR. L. S. HOPKINS,
Curator of Herbarium,
American Fern Society,
Kent, Ohio.

MY DEAR MR. HOFKINS:

The fact that I have never made a contribution to the herbarium of the Fern Society has long been a source of trouble to my conscience and, as I look over the last annual report of the Curator, I come to the conclusion that there must be many more members with a troubled conscience or else many members without any at all.

With our large membership it seems to me that it would be a very easy matter to build up a good representative collection of the ferns of the United States simply by each member going through his duplicates and contributing one set and in making collections, to add one more for the Society.

As I am not in the "Mother Country," I cannot help along that line, but decided some time ago that "our colonies should be represented," so I have taken out one set of my duplicates and as a result I am sending you, under registered mail, 500 specimens as my contribution; these are practically all Philippine material, but in order to make the set up to an even 500 I had to add some odds and ends from China, Japan, and North Wales.

The identifications are made in accordance with material which I contributed to the Bureau of Science here in Manila, and if any further study in the United States is desired a duplicate set has been presented to the Smithsonian Institution, which can be referred to. I have been unable to give the identification of the Selaginellas, as much of the material belonging to the Bureau of Science, including the set of my duplicates, is in the hands of Dr. Hieronymus, of Berlin, who is preparing a monograph of this group, and upon publication I presume this material will be cited and you will then be able to make up the identifications yourself.

I have followed the nomenclature of Christensen's Index Filicum, as that is the one adopted by the Philippine Bureau of Science.

In fixing up this set I felt that some apology should be made for the duplication of certain things; for instance, the Lygodiums possess a fascination for me; the forms look different in the field, and I cannot keep from collecting them, but when I come to compare them later they seem to run together; *L. flexuosum*, *L. scandens*, and even *L. japonicum*, then *Adiantum philippense*, *Notholaena densa*, *Cheilanthes tenuifolia*, and *Hemionitis arifolia*, are all very common about Manila, and I am always collecting a "better specimen." They make a variety as to locality and time of year.

There has likewise been much pleasure, on my part, connected with the preparation of these specimens; the few from North Wales brought back wonderful days on the mountains with all their glory of gorse and heather; the Japanese things, a day's tramp from Nagasaki to Mogi and back, and those from China, days at Hongkong, Canton, and at Nankou Pass, where one goes to see the "Old Wall of China."

In the Philippines there have also been delightful days just outside of Manila, a camp on Mt. Marivales, the climbing of Mt. Maquiling, trips through the wonderful mountains in the head-hunting country, and three unsuccessful attempts to get inside of the crater of Mt. Banahao, an old extinct volcano of about 7,500 feet elevation.

I am sure that the members of the Society will not derive anything like the pleasure out of these that I have in the collecting, but hoping that there will be some pleasure and much profit, I am,

Very sincerely yours,

D. LEROY TOPPING.

TREASURY BUREAU, MANILA, P. I.

A Word from the Editors.

In past years the editors have called upon the members to send in the sort of articles which they like best since the JOURNAL exists to represent the activities of all the members. To these calls there has been an ever increasing response. At first only about enough was received to fill the number of pages which the Society's finances would allow us to print. Now there is always on hand enough for a full number and a surplus toward the next number. It is becoming necessary now to print the contributions in the order of their receipt, and there are always things which have to be left over a number which might well be included, and other things which could be written if the funds were available for printing.

This is particularly true in the case of illustrations. Two years ago the JOURNAL published an account of a collecting trip by Mr. Ransier with numerous pictures. A friend seeing it made the comment that "she supposed that he received a lot of money for it." As a matter of fact it cost him over seventeen dollars, for he very generously stood the cost of all the pictures. This is merely one case of a sort which has occurred often. Probably half or more of the illustrations for any given year have been paid for by extra subscription.

As the President points out on another page, we are now in the position almost of asking any contributor of an article calling for an illustration to pay for this. We do not wish to discourage any writer from contributing articles, illustrations, and cash, but we feel that this load should not fall only on those who write for us. We feel that there are members who enjoy the JOURNAL although they do not write any articles for it. We ask such members to help us make the JOURNAL better by contributing toward an illustrating fund in any amount. The sky is the limit. We will use all that is sent. It may be noted that the editors have in the past made their contributions regularly.

If this appeal seems like the kind of exhortation sometimes necessary at the close of the year in churches, please remember that it merely represents the ambition of the editors to make the JOURNAL increasingly better. We expect to do this gradually by increasing the membership and the consequent dues, but until such increase has become a fact some substitute method is required.

The subscription list is now open.

R. C. BENEDICT,
E. J. WINSLOW.

The Philadelphia Meeting

A meeting of the Society was held, as announced, at Philadelphia, on December 28th and 29th, in connection with the American Association for the Advancement of Science. The Academy of Natural Sciences very kindly placed a convenient room at our disposal, and the Committee on Arrangements, Messrs. J. G. Scott, Chairman, T. C. Palmer, Wertsner, and Benedict, attended efficiently to all preparations.

Proceedings began with an informal dinner, at which the outlanders had an opportunity to get acquainted with one another, as well as with the cookery for which Philadelphia is justly renowned. All hands then repaired to the Academy, where Dr. Benedict read a paper by Paul C. Standley on the Ferns of New Mexico, which was abundantly illustrated with herbarium specimens of the species mentioned, loaned by the National Herbarium, and with excellent photographs of them in their native haunts. Mr. Redles followed with an informal and highly entertaining talk about his experiences in fern-hunting in the vicinity of Philadelphia, speaking with especial feeling of the hardships, in the way of heat,

AT THE PHILADELPHIA MEETING

From left to right—Stewardson Brown, J. G. Scott, C. H. Bissell, L. S. Hopkins, C. A. Weatherby, Herman Burgin, Bayard Long, R. C. Benedict, E. J. Winslow.

sand, and mosquitos—particularly mosquitos—which one is likely to encounter who goes forth in search of curly-grass. A social hour followed, in which the members present appeared to be taking full advantage of the opportunity to get acquainted and to compare notes and specimens.

At the next morning's session, the walls were pretty well covered with an exhibit of specimens. Messrs. Bigelow, Bissell, Weatherby, and Winslow contributed *Dryopteris* hybrids; Mr. Bissell, a very full set of forms of *Lycopodium clavatum*, *L. complanatum*, and related species; Prof. Hopkins, the North American species of *Polystichum*, including his lately described *P. Andersonii*, and a frond of probably the rarest North American fern, *Cheilanthes Parishii;* and Mr. Pickett, forms of *Pellaea atropurpurea.*

Mr. Bissell spoke on the work and problems of the Society. Mr. Jellett followed with an account of the ferns and the history of the Wissahickon Valley—classic ground, over which generations of Philadelphia botanists have worked. Next came a symposium on *Dryopteris* hybrids. Dr. Benedict pointed out the characters of some of the hybrids exhibited. He said that if collectors should now send up from the tropics specimens differing from known species as much as some of our hybrids from their supposed parents, taxonomic experts would unhesitatingly describe them as new. Yet, of our hybrids, only *Dryopteris Boottii* had been so described by the earlier American botanists. Hybridity, he said, is the best working hypothesis to account for the numerous forms of *Dryopteris.* Some plants, when crossed, produce not one, but two intermediates, according to which is the male and which the female, parent; and this tends further to explain the presence of so many different strains. Mr. Winslow said that the abundance of some supposed hybrids had been used as an argument against their hybridity. But hybridization is easy under favorable conditions, owing to the immense number of spores produced and the consequent crowding of the prothallia. And, as hybrid plants are usually more vigorous than their parents, they may be expected to outlive them and so increase in relative abundance. Dr. Benedict added that hybrids might reproduce themselves vegetatively, as fern fronds resting on the ground had been known to develop prothallial tissue directly without the intervention of a spore stage.

Mr. Scott told something of the associations and points of interest of the part of Philadelphia in which the meeting was held, and of the laying of plans for it; and reported the progress of the movement to make the fern the state flower of Pennsylvania. After passing votes of thanks to Mr. Topping for his gift of 500 sheets of Philippine ferns to the Society herbarium, to the Committee on Arrangements and the Academy of Sciences, the meeting adjourned.

About twenty members and several outside visitors attended, and I am sure all would agree with me that the meeting was thoroughly worth while, if only for the opportunity it gave to each of us to know, appreciate, and enjoy his fellow-members better and, by learning of their work, to stimulate and refresh his own interest. It is hoped this may be only the first of a series of meetings in different parts of the country.

As many as possible of the papers presented will be printed in later numbers of the JOURNAL, that those members who were not there may share, as far as may be, in the good time, and the profit, of those who were.

C. A. WEATHERBY,
Secretary.

ANNUAL REPORTS OF THE SOCIETY

Report of the President for 1914.

To the members of the American Fern Society:

The work of the Society for the past year has been handicapped to a certain extent by the inexperience of three of its officers, its president, secretary, and treasurer all being new to their positions. Prof. Hopkins, who was re-elected secretary, found that other duties claimed his attention and did not take office for 1914, the president being obliged to appoint to fill the vacancy. From my knowledge of the working of similar organizations I am sure the best interests of the Society require that the offices of secretary and treasurer should be made as nearly permanent as possible. I am glad to say that the men who held these positions for 1914 have been re-elected, and I sincerely hope that the members will see fit to continue them in office from year to year as long as they are willing to serve.

Soon after taking office it came to my knowledge that the Society did not possess a file of the *Fern Bulletin*, in which publications of its members appeared for a series of years, and that it did not even own a file of its own annual reports. This seemed a mistake and some correspondence was undertaken to try to remedy the defect. Through the generosity of Miss Mirick and Messrs. Clute and Winslow, there is now in the hands of the secretary a set of officers' reports from 1895 to date, as well as a few miscellaneous papers. The Council has also had two sets of the JOURNAL bound and placed with the Secretary. As a beginning toward a file of the *Fern Bulletin*, Prof. Hopkins has sent in copies representing eight different issues. Will not other members send in any extra issues they may have? If we have a member who has a set of the *Fern Bulletin* that they might be willing to donate to the Society, I am sure the hearty thanks of every member would be offered in return.

The report of the Secretary will tell you that we have just about held our own as to membership. The Society needs a few more members very much and I want to state as briefly as I can just why they are needed. The question of finances requires considerable attention from your officers. They have made a careful estimate of probable income and expenditure for the coming year, and it sums up as follows:

Expected income from memberships, subscriptions, etc.	**$280.00**
Estimated expense for printing membership lists, postage, mailing JOURNAL, supplies for curator, and expenses of editors and officers	**73.00**

Allowing $7.00 for unexpected expense we have available for printing the JOURNAL $200.00. This will just about pay for printing four issues of a 32-page JOURNAL without illustrations. The editors have abundant material on hand to fill an even larger number of pages, but cannot print them on account of the expense; and also they are obliged, if we have illustrated articles, to ask the contributors to help defray the cost of the necessary plates. If we had 300 instead of 225 members, the additional cost to the Society for the new members would be very slight and the income could be used to make the JOURNAL more attractive and funds would be available for the Society herbarium. If we are to have the new members desired, they must come through the individual efforts of members. Promiscuous advertising is almost useless, but personal effort with those known to be interested in ferns will bring results. Some large libraries and educational institutions are subscribers to the JOURNAL. They are a valuable asset to the Society and more such subscriptions could be secured if our members who are acquainted with the proper officials would bring the JOURNAL to their attention.

In making up the budget, no account was made of expected receipts from the sale of back numbers of the JOURNAL. As time goes on, these back numbers will be a valuable asset of the Society, but the amount received from year to year is uncertain and the Council believes that whatever is received from this source should not be used for current expense, but set aside for emergency or special work.

I doubt if the members begin to appreciate the amount of unselfish, unpaid work the editors of your JOURNAL are constantly giving to the Society. Just the matter of necessary correspondence takes a great deal of time. The editors are busy men, so, if your JOURNAL happens to be a little late in coming, make allowances. The herbarium of the Society deserves and should have more done for it than we have been able to do this year; and the thanks of the Society should be given also to Curator Hopkins for the time and labor he is giving to it.

We have a cordial invitation from one of our California members, Prof. Badè, of Berkeley, Cal., to have a meeting of the Society there when the American Association for the Advancement of Science holds its sessions there next summer, rooms for the meeting being available in the Botanical Building of the University of California, and it is proposed to arrange for such a meeting. The distance will prevent many of our members from attending, but some of them will undoubtedly visit the Pacific coast the coming summer and this meeting will give them a fine opportunity to get acquainted with the California botanists.

A second invitation from California, from Mr. H. H. Tracy, suggests the possibility of a field meeting for a week or more to some one of the great natural features of California, such as the mountains, the big trees, or Yosemite, with a chance to get well acquainted with some of the native ferns as they grow naturally. Such a trip would not, Mr. Tracy writes, be very expensive.

It is hoped to have a field meeting of the Society at some point in Central New York the coming summer.

I would suggest that members living in adjacent towns or states get together for one or more local field meetings; they will be quite worth while, even if only a few can attend.

Our Society is intended to help those interested in this beautiful group of plants to get and keep in touch one with another and can be of most value only when this is accomplished.

C. H. BISSELL.

SOUTHINGTON, CONN.

Report of the Secretary for 1914.

During the year, two members, Mr. George F. Cleveland and Mrs. M. R. Knauff, have died, as previously recorded in the JOURNAL. Ten have resigned; under the new Constitution 19 have been, regretfully, dropped for non-payment of dues; and 23 new members have been received. The present membership is 227, as against 240 on last year's list. The loss, however, is more apparent than real, since, of the 19 dropped, 12 were already more than two years in arrears in 1913 and would not have appeared in the list for that year if the present constitution had been then in force. Making this allowance, the Society has about held its own.

In this connection, one point is perhaps worth mention. Some of the members who resign give as their reason that they have no time for fern study. The provision that members are expected to engage in some line of fern study is no longer in the constitution; and those who retain interest enough to wish to help fern study in general can do it, we believe, by continuing their membership and their support of the Society. Every dollar helps.

The committee appointed some time ago to prepare a revision of the constitution finished their work during the year and their recommendations were adopted by a nearly unanimous vote. The most radical change made was the abolition of the advisory council—a body which, though excellent in theory, had not been found satisfactory in practice—and the transfer of its duties to a nominating committee, to be appointed each year by the President. The new plan had a trial at the annual election and worked well. It is gratifying also to record that the number of votes cast, though still not as large as it should be, was larger than that recorded for any other year except 1910.

A meeting of the Society was held at Philadelphia in connection with that of the American Association for the Advancement of Science. A separate report of it will be published in the JOURNAL.

The Secretary will be grateful for the prompt correction of any errors in the forthcoming list of members.

C. A. WEATHERBY.

EAST HARTFORD, CONN.

Report of the Treasurer

Financially the year has been most successful, not, however, to the extent that the large balance seems to indicate. The appended tabulation shows the condition of the Society funds on December 31, 1914, at which time there were outstanding certain unsettled accounts properly chargeable to 1914. The bills for printing the JOURNAL comprise the greater part of these unpaid claims and remain unpaid through no fault of the Treasurer, the delay being due largely to an unfortunate series of errors in billing and validating over which he had no control. A resumé of the unpaid claims properly chargeable to 1914 is as follows:

Balance as per appended tabulation	$109.12
Bills receivable—advertising	4.00
	$113.12

Bills Payable

500 American Fern Journals, Vol. IV, No. 3	$43.25
600 American Fern Journals, Vol. IV, No. 4	47.10
600 Table of Contents, Vol. IV	4.25
Postage, Managing Editor	1.00
Mailing and truckage, Vol. IV, No. 4	1.57
Author's changes	5.90
	$103.07
Balance above all charges	10.05
	$113.12

During the year the practice of delivering bills with the Journal has been inaugurated. This measure has been adopted in the interest of economy. By this means a saving of more than $5.00 has been effected over the old method of sending by letter and a still further saving of $5.00 could be made if members would be willing to have their receipts returned in the Journal. This would involve, of course, a considerable interval between the payment of the bill and sending of the receipt.

Members residing outside of New England and New York City, who pay their dues by check, could contribute to the material welfare of the Society at trivial expense to themselves if they would make their checks for $1.10 instead of $1.00. The Boston banks charge ten cents for collecting checks drawn outside of New England and the Society loses ten cents on all such accounts.

Considerable attention has been given during the year to collecting unpaid dues, with very satisfactory results. It has been impossible to represent matters to all the delinquents in such a way that they were willing to face their obligations. Some have, but others have not, and with reluctance several names have been dropped from our roll.

In the matter of new members the Society is to be congratulated, for although members occasionally resign or otherwise leave the ranks new members take their places, as will be seen by the report of the Secretary. During the past year, for instance, the receipts from new members was $25.00, while new subscribers yielded an income of $10.35.

During the year past a change in the conduct of the affairs of the Treasurer's office has taken place, a change so important that it deserves brief mention at this time. Under the old Constitution it was necessary before a bill, no matter how trivial, could be paid to obtain the consent of the Council. The new Constitution is less exacting in the matter of payments so that it has been possible to effect a change which it is hoped will result in a great saving of time and energy. This is brought about by a Budget which provides certain definite specified amounts for certain definite specific purposes covering the current running expenses of the Society and authorizes these payments by the Treasurer direct upon proof of correctness. A Budget for the year 1915 has been approved by the Council and the experiment will be tried next year of paying current running expenses direct.

For its past our Society has nothing to be ashamed of, and the present is entirely satisfactory. How shall we most wisely provide for the future? That we are growing can not be denied. Can we not grow more? grow stronger and larger and better? In my opinion this is a matter requiring most earnest deliberation. *We want more members! more subscribers!* How can they be obtained? To consider this question I propose and I make the suggestion that a Committee be appointed to consider and report.

In conclusion I wish to say that it has been a pleasure to act during 1914 as Treasurer of the Society. All with whom I have come in contact—members and officers alike—have been courteous and kind. I have one request to make to *all* our members. I want your full names for my files. Not merely your first name, but *all three names in full.* (Example—John Penfield Smith.) When you send me your dues for 1915 please send me your full name.

Appended you will find my tabular report for 1914.

Treasurer's Account from January 1, 1914, to December 31, 1914.

Receipts

Balance on hand January 1, 1914					$11.92
Membership dues—old—	1908	$1.00			
	1909	2.00			
	1910	4.00			
	1911	6.00			
	1912	6.00			
	1913	18.00			
	1914	159.70			
	1915	11.00			
		207.70	$207.70		
Membership dues—new—	1914	22.00			
	1915	3.00			
		25.00	25.00		
Total membership dues			232.70	232.70	
Subscriptions—old—	1912	.90			
	1913	.90			
	1914	25.75			
	1915	3.55			
		31.10	31.10		
Subscriptions—new	1914	10.35	10.35		
Total subscriptions			41.45	41.45	
Sale of back numbers				27.20	
Contributions				4.50	
Receipts				305.85	305.85
Total receipts					$317.77

DISBURSEMENTS

Printing and postals—vote on Constitution	$4.25		
300 Constitutions	8.50		
300 Lists of members	8.00		
1000 Letter heads	4.00		
Printing and postals—election of officers	2.89		
Binding JOURNAL, 2 sets	2.00		
Chargeable to Secretary	29.64	$29.64	
Postage, Treasurer	9.21		
1000 Bill heads, Treasurer	3.00		
To correct account with Harold G. Rugg	3.00		
Collection of checks	1.95		
Chargeable to Treasurer	17.16	17.16	
Postage, Editor	.50		
Author's corrections	3.50		
Chargeable to Editor	4.00	4.00	
500 Table of Contents, Vol. III	4.75		
500 AMERICAN FERN JOURNALS, Vol. IV, No. 1	52.50		
500 AMERICAN FERN JOURNALS, Vol. IV, No. 2	45.00		
Engravings for JOURNAL—12 plates	34.87		
Mailing and truckage, Vol. IV, No. 1	1.90		
Mailing and truckage, Vol. IV, No. 2	1.68		
Mailing and truckage, Vol. IV, No. 3	2.50		
Postage, Managing Editor	2.60		
Circulars and stationery, Managing Editor	12.05		
Chargeable to Managing Editor	157.85	157.85	
Total Disbursements		208.65	$208.65
Balance on hand December 31, 1914			109.12
			$317.77

FRED G. FLOYD, *Treasurer.*

Curator's Report

The last report of the Curator showed that the Society herbarium contained 1223 mounted sheets. Since that time Dr. O. E. Jennings has donated 14 sheets from his Ontario collections; Prof. H. H. Tracy, 27 sheets collected by him in California; Miss Laura Kimball, 3 sheets from the same state; and Dr. Ruth Marshall, 23 sheets collected by her in the Dells of the Wisconsin River. These specimens have all been mounted and catalogued, making 1292 mounted sheets now in the Herbarium.

Mr. Topping's collection of 500 sheets from the Philippines, as noted elsewhere, is the largest, as well as probably the most valuable, individual contribution that has yet been made to the Society Herbarium. In due time this collection will be mounted and incorporated into the Herbarium, making about 1800 sheets.

Members are urged to reread that part of Mr. Topping's letter which pertains to donations to the Society Herbarium. There should be in the Herbarium a complete collection of not only all the species found in North America, but their varieties and forms as well. Members and friends of the Society can aid very materially to bring this about if they will send in a complete collection of their local fern flora. Common as well as the rarer species are wanted.

The Society maintains an exchange department which is free to all members. There are now about 500 sheets, including 75 or more species, offered for exchange. List will be sent for a stamp. Members wishing to make an exchange should write the Curator before sending material as it is manifestly impossible for the department to give out the rarer species uniformly and receive only the commoner species in return.

Specimens will be identified whenever desired. Specimens sent in for identification will be placed in the Herbarium.

L. S. HOPKINS, *Curator*.

KENT, O.

At the annual field meeting of the Vermont Botanical Club held in Fair Haven, Vermont, (a town near the New York border) July 9–11, the following members of the Fern Society were present: Mrs. Nellie F. Flynn, Mrs. W. B. Jolly, Miss Mabel Strong, Dr. Ezra Brainerd, Mr. F. T. Pember, Mr. J. G. Underwood, and Harold

G. Rugg. Among the rarer ferns collected were: *Asplenium ruta-muraria, Pellaea atropurpurea, Camptosorus rhizophyllus, Aspidium spinulosum, Aspidium Goldianum, Asplenium angustifolium, Aspidium Goldianum x marginale, Aspidium cristatum x marginale, Aspidium Clintonianum x intermedium, Aspidium Boottii.*

WANTED—I would very much like to have a specimen of *Botrychium tenebrosum* A. A. Eaton, *Dryopteris Clintoniana x spinulosa, Dryopteris Goldiana x spinulosa,* and *D. Goldiana x intermedia,* and can offer the following in exchange: *D. Clintoniana x intermedia, D. Clintoniana x marginalis, D. Clintoniana x Goldiana, D. marginalis x intermedia, D. cristata x intermedia, D. cristata x marginalis, Isoëtes canadensis.*—MACY CARHART, Keyport, N. J.

WANTED—I will pay 10 cents per sheet for any North American pteridophytes not now in my collection, or will exchange. List of desiderata sent upon application.—L. S. HOPKINS, 525 E. Main St., Kent, Ohio.

Mr. E. J. Winslow, 222 Grove St., Auburndale, Mass., offers specimens of *Botrychium simplex* to members for postage.

The Librarian of the Massachusetts Agricultural College at Amherst has written, asking for copies of old officers' reports of the Fern Society, of which he wishes to get a complete file. If any members have old reports which they do not want, the Secretary will be glad to receive them, so that he can comply with requests like this.

American Fern Journal

Vol. 5 APRIL—JUNE, 1915 No. 2

Notes on the Pteridophytes of Northwestern Ontario

O. E. JENNINGS

During the summer of 1914 the writer and his wife continued their botanical work of 1912 and 1913 in northwestern Ontario, going farther to the north and northwest of Lake Superior. In 1914 the uncompleted line of the Canadian Northern Railway was taken at Nipigon, riding in the caboose of a construction train forty miles north to the southeast extension of Lake Nipigon, a long narrow fiord-like arm known as Orient Bay.

Considerable time was spent in the Orient Bay region, and then, through the kindness of Chief Ranger L. E. Bliss, of the Nipigon Forest Reserve, to whom thankful acknowledgments are made for many courtesies extended, a trip was made by launch to the extreme northern end of the lake, about sixty-five miles farther north. Here camp was established at the Revillon Frères trading post, near the head of Ombabika Bay, about three weeks being spent there. Returning then by launch to Orient Bay and to Nipigon by construction and gravel train, a trip was made by way of the Grand Trunk Lines rom Fort William to Graham, about two hundred miles to the northwest.

To the north of Lake Superior, around Lake Nipigon, it is wild in the extreme and very picturesque, but

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[No. 1 of the JOURNAL (5: 1–32) was issued March 18, 1915.]

everything is on a grand scale. The region surrounding Lake Nipigon is included in the Nipigon Forest Reserve, about the size of the State of New Jersey, and the lake itself, forming as it does the uppermost one of the series of large Laurentian Lakes, ought to be called one of the Six Great Lakes. It is about forty-five by seventy-five miles in length and breadth, has many islands of all sizes and mainly very rocky in character, and the shores are steep and very irregular. The Lake Nipigon region has been covered in the far past by a flow of diabase (Keewenawan), which has formed a very rough topography, with mountains and gorges and everywhere cliffs three or four hundred feet high exhibiting palisade structure. This whole region is densely wooded, being an unbroken wilderness of bog and terrace, cliff and valley, the new railway lines affording the only land trails. At the extreme north end of Lake Nipigon the granite underlying the diabase comes to the surface and forms a more gently rolling, glaciated surface, in places extensively burned over. In this more northern region, however, were seen some of the best examples of a pure *Picea-Sphagnum* muskeag found anywhere during the three years.

The climate of the Lake Nipigon region is one of great extremes, occasional July and August temperatures reaching 90° F., while during the winter temperatures of between fifty and sixty below zero are not infrequent. There is practically no month of the year free from frost and the temperature of the surface six inches of Lake Nipigon in late August was found to be 59°. There is usually not much snow until late in the fall and the total for the year is probably not more than two feet. Potatoes will usually mature a fair crop in sheltered spots although usually more or less damaged by occasional nips of frost.

Around Graham, two hundred miles northwest of Fort William, the geological formations vary considerably and the topography is not so rough as around Lake Nipigon. Viewed from the top of Sioux Lookout (a high knob near Graham), the general appearance is that of a gently rolling country with every hollow filled with some sort of a lake. There are in many cases merely "spillways" between the lakes, no stream channels having been there eroded. Along the Grand Trunk for one hundred miles to the southeast of Graham one can count on the average about one lake or pond for each mile traversed. The forest contains spruce muskeags, barrens of Banksian pine, mixed spruce-balsam-aspen-birch woods (especially on glacial soils and more level well drained areas), while around the lakes on rocky and gravelly slopes were formerly considerable forests of the red pine and some white pine.

In the following list of the pteridophytes collected during 1914, the same plan has been followed as for the lists of the 1912 and 1913 collections.* As for the previous lists also, grateful acknowledgment is here made to Prof. L. S. Hopkins for the identification of the various specimens.

LYCOPODIALES

1. *Lycopodium lucidulum* Michx. Margin of rivulet on elevated upland, Orient Bay, L. Nipigon. This species was not found farther north at either Ombabika or Graham.

2. *Lycopodium annotinum* L. Forming a large part of the ground cover in *Pinus divaricata* woods around a little lake east of Virgin Falls, Lake Nipigon; near Ombabika Post and on low cliff along shore of north end of L. Nipigon; mixed woods, slope of Sioux Lookout Mt., Graham.

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*Notes on the Pteridophytes of the north shore of Lake Superior. Am. Fern Jour. 3: 38–48. June, 1913, and, same title–II. *Ibid.* 4: 68–73. April–June, 1914.

3. *Lycopodium clavatum* L. In aspen-pine woods, Orient Bay; on ridge in spruce forest, Orient Bay; mixed woods, Graham.

4. *Lycopodium clavatum* var. *monostachyon* Grev. & Hook. Along C. N. R., about twenty miles north of Nipigon, at "Conmee"; mixed woods along trail, Graham.

5. *Lycopodium obscurum* var. *dendroideum* (Michx.) D. C. Eaton. Along top of ridge in spruce forest and along shore in mixed woods, Orient Bay, L. Nipigon; mixed woods along trail and on bare exposed top of Sioux Lookout Mt., Graham.

6. *Lycopodium complanatum* L. In *Populus tremuloides* woods and in *Pinus divaricata* woods, Orient Bay, L. Nipigon; and in mixed woods north of Graham.

7. *Lycopodium complanatum* var. *Wibbei* Haberer. In upland woods near Orient Bay. The range given for this form in Gray's *Manual* is "N. Vt. and centr. N. Y."

8. *Selaginella rupestris* (L.) Spring. On glaciated diabase shore of Livingston Pt., n. e. L. Nipigon; along shore of Pelican Lake and on bare top of Sioux Lookout Mt., Graham.

9. *Isoëtes Braunii* Dur. On gravel bottom, 2 feet of water midway of east shore of Orient Bay, Lake Nipigon. This is the only Isoëtes reported so far for the three seasons of collecting in northwest Ontario, although some specimens were collected in a quiet shallow place in the river at Nipigon in 1912. These specimens have been misplaced among the unidentified material somewhere, but they are probably of this same species.

EQUISETALES

10. *Equisetum arvense* var. *diffusum* A. A. E. Forms extensive and practically pure mats along the sandy

strand of a peninsula east side Orient Bay, L. Nipigon; along roadside Ombabika Post, north end L. Nipigon.

11. *Equisetum sylvaticum* var. *capillare* (Hoffm.) Milde. In deep spruce-balsam woods, Orient Bay, L. Nipigon; on half-bare burned-over granite land north of Ombabika Post, north end Lake Nipigon; on burned-over glacial till, Graham.

12. *Equisetum litorale* Kühl. Along portage, mixed woods, North Ombabika Peninsula, north end L. Nipigon.

13. *Equisetum fluviatile* L. On sandy peninsula and forming part of the rush zone in shallow water along shore, east side Orient Bay, L. Nipigon; in very boggy *Picea-Sphagnum* woods at head of Ombabika Bay, north end of L. Nipigon.

14. *Equisetum hiemale* var. *intermedium* A. A. E. On open upper beach in front of *Populus tremuloides* woods east shore of Orient Bay, L. Nipigon.

15. *Equisetum hiemale* L. On sandy peninsula east side Orient Bay, L. Nipigon.

16. *Equisetum scirpoides* Michx. In *Picea-Sphagnum* woods at head of Ombabika Bay, L. Nipigon (muskeag); southwest shore of North Ombabika Peninsula, L. Nipigon; on ridge, in spruce woods, west side Orient Bay, L. Nipigon.

OPHIOGLOSSALES

17. *Botrychium neglectum* Wood. In *Populus tremuloides* woods, sandy peninsula, east side Orient Bay, L. Nipigon.

18. *Botrychium ternatum* var. *rutaefolium* (A. Br.) D. C. Eaton. In swampy place on low sandy peninsula and under *Populus tremuloides* woods, Orient Bay; along shore of Pelican Lake, and on west slope of Sioux Lookout Mt., Graham. This marks a still greater extension of range to the north and west of that reported in the 1912 collections.

19. *Botrychium virginianum* L. In mixed woods on slope of ridge and in *Populus tremuloides* woods on sandy peninsula, Orient Bay, L. Nipigon; *Fraxinus nigra* swamp at south end of Pelican Lake, Graham.

FILICALES

20. *Osmunda Claytoniana* L. Recent clearing along C. N. R. at Orient, L. Nipigion; along log road, Ombabika Post, north end of L. Nipigon; along trail in mixed woods, Graham.

21. *Polypodium vulgare* L. On rocks jutting out of muskeag, Conmee, 20 miles north of Nipigon; on diabase talus slope, Orient Bay, L. Nipigon; steep diabase cliff north end of L. Nipigon, Ombabika portage; slope of Sioux Lookout Mt., Graham. Of the last mentioned specimen Prof. L. S. Hopkins notes: "It is easy to see from these fronds why it is sometimes called 'Golden Polypody.'" One of the older, half-dead leaves looks almost as though gilded.

22. *Phegopteris Phegopteris* (L.) Underw. Spruce woods on top of ridge, and balsam-spruce slope woods, Orient Bay, L. Nipigon; south shore North Ombabika Peninsula, L. Nipigon; shore Pelican Lake, Graham.

23. *Phegopteris Dryopteris* (L.) Fée. On sandy peninsula, on diabase talus slope, and in spruce woods on top of ridge, Orient Bay, L. Nipigon; on glaciated granite, Ombabika Post, and on low diabase cliff southwest shore North Ombabika Peninsula, L. Nipigon; sheltered mossy bank, slope Sioux Lookout Mt., Graham.

24. *Pteridium aquilinum* (L.) Kuhn. In birch-spruce-poplar woods, Orient Bay, L. Nipigon; Sioux Lookout Mt., Graham.

25. *Athyrium filix-foemina* (L.) Roth. C. N. R. right-of-way, rocky bank of rivulet, and in spruce woods at top of ridge, Orient Bay, L. Nipigon; on glaciated

granite, Ombabika Post; and in mixed woods on diabase, North Ombabika Peninsula, L. Nipigon; mixed woods, Graham.

26. *Dryopteris fragrans* (L.) Schott. On diabase cliff east of Virgin Falls, on diabase talus slope east side Orient Bay, and on steep diabase cliff south shore North Ombabika Peninsula, L. Nipigon; in crevices on bare knob of Sioux Lookout Mt., Graham. Perhaps the most characteristic fern of the Lake Nipigon region—abounding on the numerous cliffs and talus slopes.

27. *Dryopteris cristata* (L.) Gray. Along mountain rivulet and in marshy *Myrica* bog, Orient Bay,

28. *Dryopteris intermedia* (Muhl.) Gray. Conmee, 20 miles north of Nipigon; damp woods, Virgin Falls, foot of L. Nipigon; wooded top of diabase hill, Sand Point, L. Nipigon; under *Alnus* along border of rivulet, Ombabika Post; mixed woods and in *Fraxinus nigra* swamp, s. end Pelican Lake, Graham.

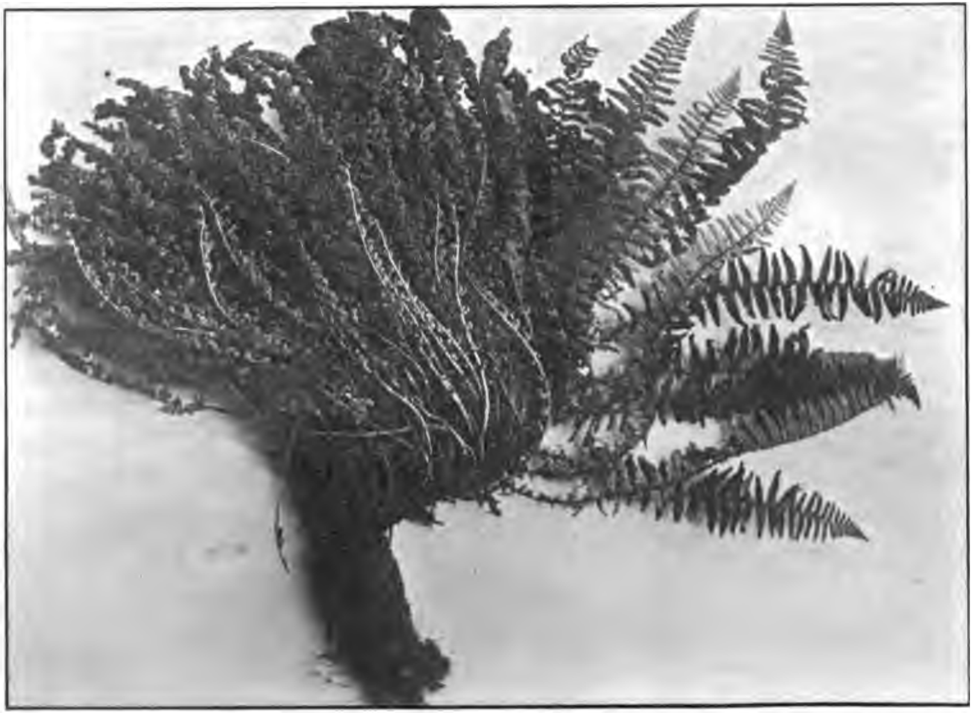
29. *Filix fragilis* (L.) Underw. Crevices in high diabase cliff, Orient Bay, on rocks east of Virgin Falls, and on low diabase cliff s. w. shore North Ombabika Peninsula, Lake Nipigon; sheltered mossy bank, slope of Sioux Lookout Mt., Graham.

30. *Woodsia ilvensis* (L.) R. Br. Diabase cliff, east of Virgin Falls, on diabase talus slope, Orient Bay, and on rocks along shore of N. Ombabika Peninsula, L. Nipigon; bald top of Sioux Lookout Mt., Graham.

31. *Onoclea sensibilis* L. Along C. N. R. right-of-way, Orient Bay, L. Nipigon. Not seen farther north.

32. *Matteucia Struthiopteris* (L.) Todaro. Bottom of deep narrow gorge, Orient Bay, Lake Nipigon.

CARNEGIE MUSEUM, FEB. 6, 1915.



AN INTERESTING SPECIMEN OF DRYOPTERIS FRAGRANS

An interesting specimen of the Fragrant Shield Fern

LEWIS S. HOPKINS

The following note attached by the writer to sheet number 7084 of Dr. Jennings' Ontario collection may be of sufficient interest to warrant its publication in the Fern Journal. The fern in question was collected August 19, 1914, on a steep diabase cliff on the south shore of north Ombabika peninsula, Lake Nipigon, Ontario.

Dryopteris fragrans (L.) Schott. (7084). This is a very remarkable plant in that it has about 120 (counted as accurately as possible without destroying the plant—a few did drop off) dead fronds and 10 mature live fruiting fronds—130 in all at the time of its collection. The five other specimens of this species collected on the present expedition show 5, 7, 9, 4, and 6 green fronds respectively, an average of about seven green leaves to the plant including the first plant.

Using this figure as the basis of the average annual leaf production, some of these dead fronds are at least 17 years old and the whole plant 18 years old. If it produced 10 fronds annually, they are 12 years old and the whole plant 13 years old. From these figures it seems perfectly reasonable to conclude that the oldest set of dead fronds is at least 15 years old.

But this is not all. The rootstock is about 12 centimeters long and for the first 5 centimeters it bears no dead fronds. The plant then grew 7 centimeters in 15 years, an average annual growth in the length of the rootstock of 0.466 centimeters. Since the root stock is 12 centimeters long this would make the age of the plant 25 years. But there is no means of knowing whether all of the rootstock was collected with the plant and if not how much is missing. The plant might easily be

50 years old from the germination of the spore to the time of its collection.

It is not possible by this means to determine the exact age of the plant but there are two important as well as interesting points involved.

1. There is sufficient data to warrant the conclusion that the plant has lived quite a long time.

2. A plant which takes such precaution to retain its old leaves must certainly derive some benefit from them and it is not improbable that these dead leaves in the process of decay and under the influence of the warmth of the summer sun yield something that is of vital importance to the plant in its subsequent growth.

Commenting upon this note Dr. Jennings says: "I had not hought of any particular old age characteristics when I took that specimen from its home on the hot (on *that* day) dry cliff at the top of the talus slope. Now that I think of it I am sure that there could have been collected at that place others which would have shown almost twice as big a bunch of leaves. Whether these would really have been older or not I do not know. Perhaps they might have borne more leaves each year or have retained the old leaves longer but I am sure there were much larger bunches."

STATE NORMAL SCHOOL, KENT, O.

Where Ophioglossum grows. (A Multiple Report.)

As a result of my query about the habitat of *Ophioglossum* in the last number of the FERN JOURNAL for 1914, many interesting reports have come in and I am printing them just as received. In connection with these I am printing also the comment of D. C. Eaton in his "Ferns of North America" on the same subject. No matter how thoroughly one may have studied any particular fern of our Eastern states, it is always safe to turn to Eaton's pages and see what he has to say on the same species. Very often it will be found that he had already recorded facts of which the latter student had believed himself to be the discoverer. His comment on the present subject is as follows:

"Hab.—Commonest in low meadows, but sometimes on dry hillsides." (Page 261.) . . . "The height varies from two to three inches on dry hillsides to over a foot on damp grassy meadows." (Page 262.)

In connection with my call for information, I find I made a considerable mistake in quoting a correspondent as having written that *Ophioglossum* grows in pine barrens in New Jersey. "It is distinctly," I am quoting exactly now, "a plant of the middle district and the coast, very different life-areas from the pine-barrens."

Besides his statement of the localities where he has found *Ophioglossum* himself, Mr. Weatherby has an interesting suggestion to offer as partial explanation of the fact that this fern is to be found both on dry land and in wet meadows, which I print here as introductory to the whole discussion. "May it not be that *Ophioglossum,* like some other species, frequents dry situations in one part, and probably the northern part, of its range, and moist ones in other regions?"

R. C. BENEDICT.

I have two sheets of *Ophioglossum.* One was collected at Barkhamsted, Conn., in moist places in a typical pasture, and I should say where it was shaded by bushes somewhat. The other, South Windsor, Conn., was in an open grassy meadow, near but not in a sphagnous bog in which *Arethusa* and pitcher plant grew. I have also found it in the low moist part of an open meadow in Bloomfield, Conn. In this case it grew near a drainage ditch, in ground which may very likely have been covered with water in early spring.

In the herbarium at Cambridge there are two specimens besides Mr. Knowlton's recorded from dry ground. They are: "Dry thicket, Milo, Me., *M. L. Fernald*," and "Dry field, Colebrook, N. H., *A. S. Pease*." It is perhaps significant that both are from northern New England. There were two or three cases of non-committal data, such as "mowing field" and "sheep pasture," but most of the labels distinctly indicated at least moist ground.

C. A. WEATHERBY.

Regarding *Ophioglossum vulgatum*, I recall finding it in August at New London, N. H., on the south slope of a high steep hill, Brown's Hill, I think was the name—not far north from Pleasant Lake. My recollection is that it was decidedly dry, and that the grass was dead. The slope was so steep that it was difficult for me to keep my feet. I found quite a number of plants in the grass.

EUGENE T. ALLEN.

In my younger days I considered it a very rare fern, at least in this vicinity (Bedford, Mass.). Later I called it "uncommon," now I think "unnoticed" would better describe it.

My first find was Chelmsford, Mass., Sept., 1882, a fertile frond cut off by a scythe. The plant was determined by my old friend, Asa Gray. In August, 1883, in the same locality, fine specimens met Mr. Charles Swan. Now hardly a year passes without my meeting plants of it, generally after the grass has been cut so that the fertile spike is missing.

I find it in what we call "meadows," that is, damp land of natural grass and sedge, and more frequently on brook than on river meadows. *Orchis virescens* is a frequent neighbor. This is true for the locality of Chelmsford and Bedford, Stowe, Vt., and Hardwick, Mass. I recall but one find on comparatively dry land, on a mowing field near meadow land.

CHARLES W. JENKS.

I have found *Ophioglossum vulgatum* in moist meadows, but much oftener in hillside pastures, in which habitat it is, of course, much easier to discover. I have in mind such a pasture in northern Vermont, which occupies a ridge from which the land slopes on one side with a pitch of not much less than 45 degrees to the river 150 feet or more below. The soil is clay over a slaty shale ledge, and that it is well adapted to moisture-loving plants is shown by the presence of *Liparis Loeselii*, occasional clumps of the Osmundas, and all the New England Botrychiums except *lanceolata*.

I recently looked through the material in the Herbarium of the New England Botanical Club, noting the various statements of habitat and the number of sheets on which each statement was used with the following result—"Damp meadow," 6; "Low thicket," 3; "Dry field," 3; "Bog," 2; "Dry pasture," 2; and each of the following on one sheet—"Mossy meadow," "Dry thicket," "Gravelly swamp," "Swamp," "Moist pasture." Of course, many labels showed no description of locality.

E. J. WINSLOW.

My experience is that the plant you refer to will grow almost anywhere. It simply is overlooked. I have it from sunny meadows and shady wet nooks where it grows to a huge size.

F. G. FLOYD.

Where have I seen the adder's-tongue fern growing? I looked for it several seasons in damp places and never got a sight of it. Looked where others indicated were likely places.

My first find was on a bank in a pasture, facing northerly not far from the edge of woods. Only a few specimens, but one pair of "twins." No water, no sphagnum near; northwest of Jamesville, N. Y.

While searching for Botrychiums in a thicket of prickly ash I ran across my next lot of adder's tongues. Not very thrifty ones, but many of them and a good proportion of them fruiting. The thicket was so dense that I had to crawl through it, and the foliage overhead was one continuous mass, forming a tent-like place beneath. This thicket was on the crest of a rocky ridge between Scolopendrium Lake and White Lake, east of Jamesville. A few rods further north I found scattering specimens under sumacs where red raspberries fringed the woods. Not far away, along a wood road, among scattering blackberry bushes, a few more specimens were located. In this station the adder's tongues came up through squawberry vines which closely covered the surface in luxuriant growth. The soil was well drained. Others were noticed on a small hummock, in a small glen, beside a cow path, but partially shaded; sandy loam; no suggestion of wet, sphagnum or muck; about ¼ of a mile east of the other stations just mentioned, 100 feet above the lake level. Only one lone specimen has been reported before from this well-known locality.

As thrifty and abundant a lot as I have found was near Labrador Pond, south of Tully, N. Y., on the northwestern side of the pond, as I was climbing up toward the wooded height, through pastured land. Where the grass was deepest, near wild rose bushes, or above woodchuck holes, or on the steeper faces where cattle avoided it, were very, very many specimens, the largest and best I have collected. This hillside was far too steep to climb with ease, and quite dry.

H. E. RANSIER.

The adder's-tongue fern is interlinked with my early collecting days. I well remember the 14th of August, 1892. Mother wished me to get her some high blackberries in a pasture not far from the house and I went rather reluctantly, as I preferred to go collecting. I returned highly delighted, having found, for the first time, the *Ophioglossum* growing abundantly in a dry hemlock loamy pasture, one-fourth of a mile from the house. It was a red letter day for me; and the previous three seasons I had trod on the plant frequently without being aware of its presence. Indeed, I was expecting to find my first plant in wet bogs: as the Gray's Manuals placed "bogs" first as the habitat for this fern ally.

A note in reference to my localities was published in the Linnaean Fern Bulletin IV: 62. October, 1896; also in the same issue, page 68, I offered 100 specimens of *Ophioglossum* as a Chapter Fern. Some of these specimens fell into the hands of Mrs. Elizabeth G. Britton, who first wrote me in regard to them while I was in college at Ann Arbor. Quoting from her letter of 22 November, 1897, written at New Dorp, Staten Island, she says: "I have received your interesting letter and the fine series of specimens of Ophioglossums from your mother. They really are remarkable for the variety of gradations and variations they show in this species, and are particularly valuable to me just now; as I have been puzzled where to draw the line between *O. vulgatum* and the colony of what we have called *O. arenarium* which we found at Holly Beach. I think if you could have seen it you would agree with me, that it was not *O. vulgatum*, and yet there are small forms of that species which come very close to it. I have written an article for the Bulletin of the Torrey Botanical Club, which I expect to print in December with illustrations."

The following summer I carefully collected a series of specimens for Mrs. Britton; and after my return to the University of Michigan received the following letter (in part) from her: "The packet of *Ophioglossum* is here safely, and I am much obliged. You certainly have found some very interesting intergrading forms, which go far to show that *O. arenarium* is only a starved form of *O. vulgatum*, but my seaside specimens still keep a character of their own which I have not seen matched by any inland forms of *O. vulgatum*. The nearest I have seen were some collected by Mr. A. A. Eaton at Seabrook, N. H., which he showed at the meeting of the Linnaean Fern Chapter in Boston in August."

During the year 1896, I found the adder's-tongue fern in several rather widely separated localities within a radius of three miles of the house; and almost always in old "hummocky" pastures where considerable mouse-ear plantain, *Antennaria*, *Carex pennsylvanica*, and sometimes reindeer moss, *Cladonia*, grew. Once I found it in a cut-over upland meadow. In another locality a few plants were found in a tiny desiccated hollow in a thick woods of beech and sugar maple, in heavy clay soil, and in a sedgy swale, composed largely of *Carex riparia* and *Carex stricta*, surrounded by hard clay soil, near one of our larger creeks, several fine *tall* fruiting plants were found. The 27th of June, 1898, I note that plants growing in dry loamy pastures "vary from a few inches to nearly a foot in height. One or two or even three plants arising from a single root and all fruiting. Particularly more than one plant when the plants are crowded." I do not recall of ever finding the plant but once in a bog where *Sphagnum* grew, the 3 November, 1900, when two small sterile plants were found in New Michigan Pond marsh in southern West Fort Ann, N. Y. The 15th of June, 1907, *Ophioglossum* was found on the Anaquassacook meadows south of Shushan, N. Y., near the Fly Kill, which empties into the Battenkill river at this point. These meadows are low lying. The 12th of June, 1909, a few plants were found in a tiny wet place north of Round Lake, N. Y., near the creek.

The late Mrs. Lucy A. Millington, the 19 June, 1872, wrote Mr. Wm. H. Leggett, from Glens Falls, N. Y., "*Ophioglossum vulgatum* I find in nearly every swampy bit of grass." There are specimens in the New York State Herbarium at Albany, collected by the late Dr. George D. Hulst on Assembly Point, Lake George, August, 1897, "in damp grassy places." Mr. Wallace Greenalch, of Albany, in 1907 collected *Ophioglossum vulgatum* in a "meadow near Winnie brook on the Baker farm at Schuylerville, N. Y." Mr. Frank S. Pember, of Granville, N. Y., the 21 September, 1908, speaks of this plant as being rather common, but gives no habitat.

During the collecting season of 1913 I failed to bring the plant in, although I very often went where I found it so abundantly in 1892 and 1896. I looked more carefully for it during 1914, but I did not find a dozen dwarfed specimens, for the loamy soil was very dry and parched. Can it be that the successive dry seasons of late years have killed the plants outright; or are the plants somehow carried over these years, resting as the Botrychiums sometimes do? I also visited during 1914 the sedgy swales, and found the plant growing about as abundantly and luxuriantly among the tussocks as it did 18 years ago.

STEWART HENRY BURNHAM.

On May 9, 1914, a cluster of about fifty plants was found three miles west of Bloomington, Ind. These plants were all within an area of four square yards, at the edge of a bush patch on a northwesterly slope near the low and somewhat marshy soil bordering a natural drain. The soil was a stiff clay covered with a very light layer of humus and dead leaves. The plants were from 6 cm. to 10 cm. high, but with the spores not quite mature.

About a week after making the above find, on May 14 to be exact, I was tramping with Prof. D. M. Mottier, of Indiana University, over the rough limestone country about 5 miles northwest of Harrodsburg, Ind., when we found another group of *O. vulgatum.* This group showed as many plants as the first, but more closely placed, and somewhat larger than the others. There were no mature spores. This group was on top of a considerable hill, with quite dry soil and a shading of beech and sugar maple. Many of the plants were growing in a path which had recently fallen into disuse.

F. L. PICKETT.

Note upon Polypodium subtile and a related species[1]

WILLIAM R. MAXON

Polypodium subtile Kunze, described in 1847[2] from Merida, Colombia, upon specimens collected by Moritz (no. 325), is a diminutive outlying member of the group of *P. cultratum* Willd. which has been rather widely but not frequently collected, the range ascribed to it by Christensen being "Jamaica, Venezuela-Peru." The Jamaican record is erroneous and comes from including

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[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] Linnaea **20**: 375.

in the concept of this species a closely related but very distinct plant described from the high mountains of Jamaica, nearly forty years ago, as *Polypodium albopunctatum* Baker,[3] and apparently confined to that region. Baker's name being invalidated by *Polypodium albopunctatum* Raddi,[4] applied to a Brazilian plant of the Goniophlebium group, the new name **Polypodium cretatum** is here proposed for the Jamaican species, in allusion to the thin chalk-like scales which overlie the hydathodes on the upper surface of the leaf segments.

Of *Polypodium cretatum* the following specimens, all Jamaican, are in the National Herbarium: Upper slopes and summit of Sir John's Peak, *Underwood* 3181, 3187, 3199, 3203; slopes of Monkey Hill (above New Haven Gap), alt. 1800 meters, *Maxon* 2702, 2754; near Mabess River, alt. 900 meters, *Maxon* 1570; without special locality, *Hart* 71. These agree essentially with Baker's original description, also with Jenman's redescription[5] of *P. albopunctatum* Baker.

Polypodium subtile Kunze is known to the writer from several fragments of the type collection (*Moritz* 325) in the Underwood herbarium and from two additional collections, both of which agree with the type. The first is a Colombian plant (*Lehmann* 7381), cited as *P. subtile* by Hieronymus;[6] the other consists of excellent Guatemalan specimens collected by von Tuerckheim (*J. D. Smith* 964), distributed as *P. albopunctatum* Baker. From these it is seen that *P. subtile* differs rather noticeably from *P. cretatum,* (1) in its copiously long-pilose fronds, the hairs stramineous to pale reddish, 1.5 to 2.5 mm. long (not stiff, reddish brown, averaging 1 mm. long); and (2) in its few, rather large basal segments, these abruptly discontinuous (not gradually smaller, long-decurrent, and finally evident as slight alar prominences). The rhizome scales are similarly fuscous, but those of *P. subtile* are shorter, relatively broader, and more persistently ciliate. The thin, peltate, flake-like, cretaceous scales, overlying the hydathodes singly, are characteristic of both species.

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[3] Journ. Bot. Brit. & For. **15**: 265. 1877.

[4] Opusc. Sci. Bol. **3**: 287. 1819.

[5] Bull. Bot. Dept. Jamaica II. **4**: 116. 1897.

[6] Bot. Jahrb. Engler **34**: 506. 1905.

Some experiences in fern-hunting near Philadelphia

GEORGE REDLES

(As narrated at the Fern Society meeting, Dec. 28, 1914)

It was with some misgivings that I complied with Mr. Scott's order to address you, and I think the best thing I can do will be to relate some of my experiences.

Mr. Joseph Meehan claimed that *Aspidium Goldieanum*, as figured in Meehan's Monthly, was too narrow in outline and did not agree with any specimens that he had seen. As he, Edwin Jellett, and myself took botanical trips together, we were very anxious to find some of this species in our rambles. As we had canvassed most of the locality within twenty miles without results, we began to despair of ever finding it, though Prof. Meehan claimed the specimen figured had been collected in the Wissahickon. One Sunday, after a most delightful trip along Edge Hill to the Pennypack, Joseph remarked: "Wouldn't it be a grand ending to a perfect day to find some *Goldieanum*?", and, while drinking from a spring which ran down along a gentle slope, I noticed a number of extra large ferns growing in the water among stones and proceeded to investigate. On picking a frond and looking for the spore-cases, I found them to be very close to the mid-vein and on my showing it to Joseph, he let out a "Hurrah!" and said: "We have found it at last." It proved to be the best clump I have ever seen, and the plants bore out what he had contended. We visited the locality this fall and were sorry to find a fire had swept through it. I am afraid the colony has gone forever.

I have since found three plants in the Wissahickon which have endured for ten years and are there still. I also came across a fine clump at Cold Spring Harbor while residing at Oyster Bay.

Of course, we were anxious to find *Asplenium ebenoides*, now called Scott's fern. The place of its original discovery has been destroyed and our discovery of it was longer delayed than that of *Aspidium Goldieanum* by a number of years—in fact, the original trio had ceased to explore together. It was while with two other companions in the vicinity of Marshall's Creek, Monroe Co., that we came across two fine specimens. Of course, I brought one away with me and grew it in a four-inch pot and for three years it thrived finely. But when I moved to Long Island I took it along and for no reason that I could see, it immediately started on a down grade and after two summers over there it perished, far from its native state.

Camptosorus, one of the supposed parents of *A. ebenoides*, as claimed by some, I have found to be common, if wide distribution makes it common. I have found it on almost every tramp of any extent in a west and northerly direction.

I have also had some interesting experiences in connection with trips to Quaker Bridge after *Schizaea* and other things of interest to be found there. In late July or early August, Prof. Stewardson Brown says, the railroad station at Atsion is about the hottest place this side of the hereafter, and the walk of four Jersey miles, through soft white sand, tormented by countless myriads of mosquitoes and a few black flies, makes the arrival at the bridge, with its cool, coffee-colored, cedar swamp water, like reaching an oasis in the Sahara. One feels as if gallons would be insufficient to slake one's thirst; and it is no hardship, after such a walk, to go floundering around in the sphagnum and water up to your knees in search of the smallest fern that grows, around the bases of the swamp cedars. The Egg Harbor station is like going into a parlor along side of the effort necessary to be successful at Quaker Bridge.

It was while trying to get a little relief from the hordes of mosquitoes that pestered us, that we found it was delightfully cool ten yards in among the cedars and, from some unexplained cause, the mosquitoes were almost entirely absent. There I found that rarity, *Habenaria integra*, a single plant growing and blooming in the dense shade.

I will conclude by mentioning a single plant of *Pellaea atropurpurea* growing in a crevice of a cliff at Dark Hollow along the Neshaminy Creek, which remained for close to twenty years alone, as I never found any more anywhere in the vicinity.

PHILADELPHIA, PA.

Notes and news

A REVIEW: THE FERNS OF ALLEGHENY COUNTY, PENNSYLVANIA.* By L. S. HOPKINS.

In his "Ferns of Allegheny County," Mr. Hopkins has issued a very interesting and attractively illustrated little manual. It comprises a total of 130 pages of which about half are half-tone plates. Some of these plates are from herbarium specimens, some from live plants in their natural state. Nearly all of these pic-

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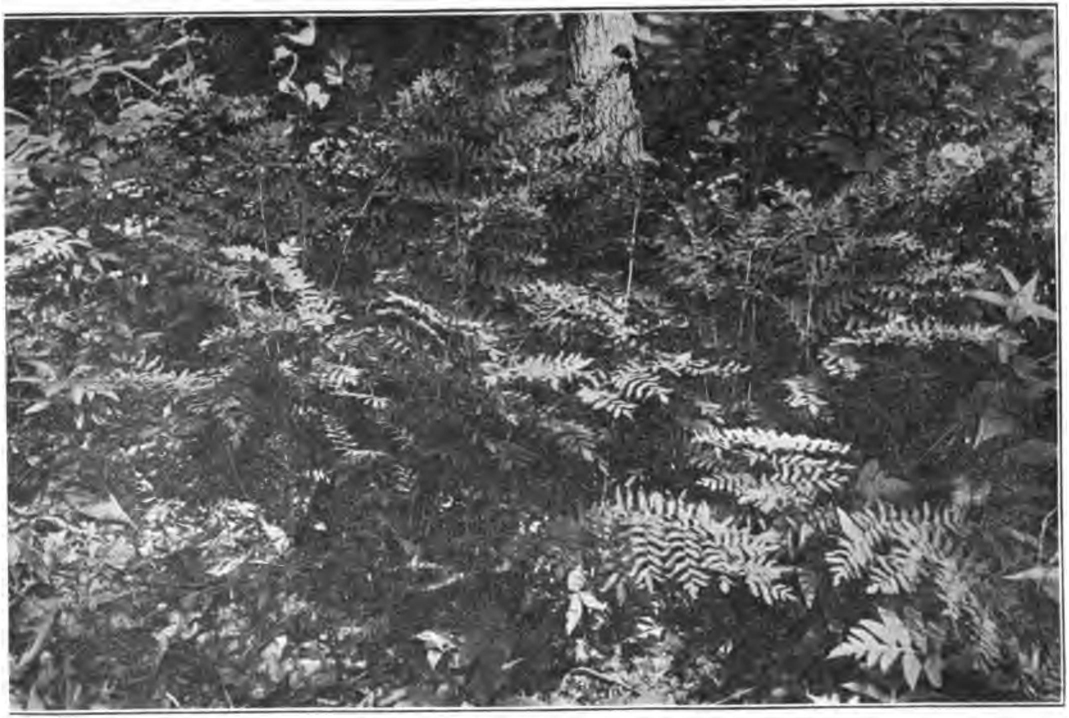
*Publication III, Botanical Society of Western Pennsylvania. Issued August, 1914.



OSMUNDA REGALIS

(Reprinted by permission from Hopkins' *Ferns of Allegheny Co., Pa.*)

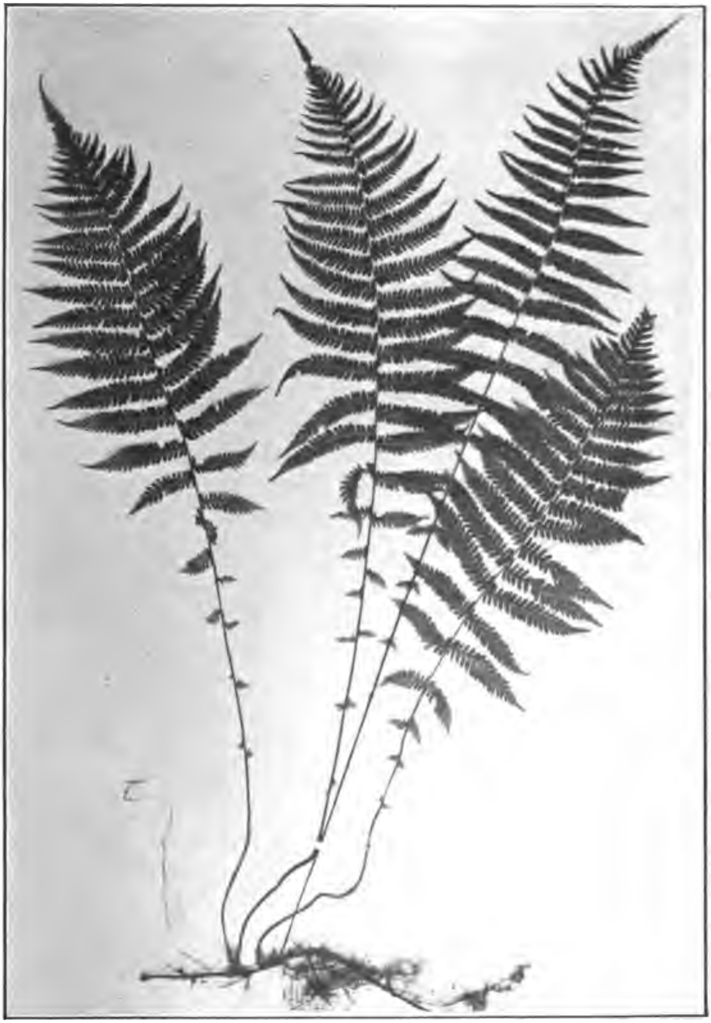
tures serve the purpose for which they were designed, i. e., to give the beginner a good idea of the appearance of the species illustrated.

With the pictures there is given brief text descriptions of each of the species, some citation of specimens, and further comment regarding the rarity, habits, and other points of interest. In this connection I noted a comment regarding *Ophioglossum* as follows: it "cannot be regarded as a common plant anywhere and it is safe to say that it is known to a greater number of persons from having seen herbarium specimens than from having seen it growing." The statement is probably correct in the main, but I should like to invite Mr. Hopkins to go with the Torrey Club toward the last of June to a Hackensack meadow where thousands of plants of *Ophioglossum* grow.

Mr. Hopkins's opinion of Mrs. Parsons's "splendid little book" exactly meets the views of the reviewer who began his fern study with "How to Know the Ferns," and found its pages interesting and helpful in this connection. Another discriminative comment, anent the walking fern, is as follows: "This fern owes much of its popularity to its name, which seems to be of such a nature that it excites the interest and admiration of even those who do not profess to be fern lovers."

Two of the spinulose ferns are given popular names which are entirely new to the reviewer. *Dryopteris intermedia* is called the "American shield fern," and *D. dilatata* is called the "spreading shield fern." Both names are applicable, but hardly distinctive enough. There are too many other American shield ferns, and there are also other spreading shield ferns. American spinulose fern would be better, and spreading spinulose fern, but there is already a good name for *D. dilatata:* it should be called the Alpine or mountain shield fern.

But these are minor points. The reviewer is glad to recommend the manual for beginners' use both in field



AN HERBARIUM SPECIMEN OF DRYOPTERIS NOVEBORACENSIS
(Reprinted by permission from Hopkins' *Ferns of Allegheny Co., Pa.*)

and at home. The wealth of illustrations will serve to make identification of common ferns an easy task. (Two of the plates are here reproduced through the courtesy of Mr. Hopkins.)

R. C. B.

THE PROTHALLIA OF OPHIOGLOSSUM AND BOTRYCHIUM

The prothallia of ordinary ferns are so well known and so easily obtained that the ordinary stages of prothallial growth are matters of elementary instruction in botany. The prothallia of *Botrychium* and *Ophioglossum*, however, are very uncommon and even yet only a few kinds have been found, altogether five species in *Ophioglossum*, and three or four in *Botrychium*. Of these five are fairly well known, the others only incompletely. When it is considered that there is a total of over fifty species in these two genera distributed all over the earth it seems strange that so little is known about them.

Prof. D. H. Campbell, of Leland Stanford University, has given special study to these two genera, and has made extensive trips to the tropics to secure material of them. In Java, he secured good material of *Ophioglossum moluccanum* and *O. pendulum*, as well as of other ferns of interest. He had as long ago as 1892 begun his study of *O. pendulum*, and about the same time of *Botrychium virginianum*. In the intervening time other writers have found and studied *Botrychium virginianum* more completely (Jeffrey), *Ophioglossum vulgatum* and *B. Lunaria* (Bruchman). These five species are really the only ones which are at all thoroughly known, and there are many points about these still to be cleared up. The other species on which a small amount of work has been done are as follows: *B. matricariaefolium* and *B. simplex*, and *O. intermedium*. The list has been given thus completely because our knowledge of the prothallia of this group of ferns is so small that the finding of the prothallia of any of the species even of those fairly well known, would be well worth notice, especially if the material were in shape for study. It is suggested that if anyone of the readers finds any of these prothallia, they take care to collect them fresh and send them to some university where they can be studied. They may be looked for wherever colonies of plants are found.

Professor Campbell has recently brought together all the results of his and other's studies in connection with a monograph on the whole group *Eusporangiatae*, which includes the *Ophioglossaceae*, and the tropical *Marattiaceae*. (The *Eusporangiatae;* the comparative morphology of the *Ophioglossaceae* and *Marattiaceae*. Carnegie Institution of Washington, Publication 140, pp. 1-229, figs. 1–192, plates 1–13. 1911.) The facts in the present article are derived from the above publication.

The prothallium of *Ophioglossum* as far as known is always a brownish subterranean body, more or less cylindrical in shape. It is also always infected with some kind of fungus without which it seems unable to thrive. Attempts to grow the prothallia from spores have been practically unsuccessful, apparently because none of the fungus was present in the soil used. The prothallia of *O. vulgatum* are reported to be as much as two inches in length. Their general resemblance is to a root, and, Bruchman believes, they may live as long as twenty years. The antheridia and archegonia are born on all sides.

The prothallia of *Botrychium Lunaria* and of *B. virginianum* are flatter and bear the sexual organs only on the upper surface, the antheridia along the middle and the archegonia in two rows alongside. Like those of *Ophioglossum*, they have no green color. In both genera, however, the spores contain some chlorophyll. The prothallia of *Botrychium* are probably at times very long lived. They have been found attached to fruiting plants of *B. virginianum.*

The writer has found prothallia of these plants twice, once of *B. virginianum* which were buried a couple of inches in the soil of a cedar forest, and one of *B. obliquum*, in a thicket, an inch or so deep. In both cases they were attached to young immature plants and appeared as small tubers. Readers of the JOURNAL are urged to keep careful watch for them especially in the case of the species which have been incompletely studied.

R. C. B.

The editors have received from Mr. H. H. Tracy, P. O. Box 173, Fullerton, Cal., too late to be printed in full in this number of the JOURNAL, a most attractive outline of a week's camping trip in the Yosemite region which he has arranged for members of the Fern Society. The party will leave San Francisco immediately at the close of the Association meetings on Aug. 7, will go by rail and auto to the Mariposa big tree grove and thence on horse-back, with guides, to Glacier Point, Sunrise Meadows, Tuoloumne Meadows, Lake Tenaya, and the head of the Yosemite Falls, descending thence into the Yosemite Valley and spending two and a half days there. The cost of the trip, exclusive of railroad fares to and from San Francisco, will be from $55 to $60 per person. Further information may be obtained from Mr. Tracy and members intending to go should notify him not later than July 1st.

American Fern Society

The Treasurer of the Society, Mr. Fred. G. Floyd, having resigned from his position, it became my duty to appoint a successor. As Mr. Floyd considered it desirable that he be relieved of his duties as soon as possible, Mr. H. C. Bigelow, New Britain, Conn., consented to act temporarily as Treasurer. Later I appointed Mr. Jay G. Underwood, Hartland Vt., to fill out Mr. Floyd's unexpired term.

C. H. BISSELL, *Pres.*

The Council has received two applications for life membership, one of them accompanied by a tender of $15 in payment. At present there is no clause in the Constitution covering this point, and any action taken must be by special vote of the Council. That there may be a general rule to be followed in such cases, it is proposed to submit at the next election an amendment, to be voted on by the members, providing an additional clause in the Constitution covering the point in question. The Council will be glad to receive suggestions from members as to the form this shall take to be for the best interests of the Society.

C. H. BISSELL, *Pres.*

The following order has been passed by the Council:—
"The Editor of the JOURNAL, Dr. Benedict, having informed the Council that he must either resign as editor or transfer some of the duties of his office to an assistant, and it being the opinion of the Council that Dr. Benedict's aid should be retained if possible, it is hereby ordered that until further action is taken by the Council, the editing of the JOURNAL be placed in the hands of

Dr. R. C. Benedict, Prof. E. J. Winslow and Mr. C. A. Weatherby, as joint editors, they to be at liberty to arrange the division of their work as may seem best to them."

The request for copies of the Fern Bulletin in the President's report has met with a generous response. Particularly noteworthy gifts are those of Mrs. W. F. Brooks, who has presented to the Society all of the rare early numbers of the Bulletin up to Vol. V, with one exception, and of Mr. J. R. Swinerton, who has given 26 numbers of the Bulletin, including Vols. VI–XI complete, and eight miscellaneous pamphlets relating to the Society. The number missing from Mrs. Brooks's set has been purchased and the Society now has a full set of Vols. I–XI of the Bulletin, with the exception of Vol. V, no. 2. If anyone knows where this number can be obtained, the Secretary will be glad to hear of it.

Other gifts, which are hereby gratefully acknowledged, are: From Mr. A. W. Driggs of East Hartford, Conn., 5 numbers of the Bulletin; from Mr. F. C. Greene, 6 numbers of the Bulletin and title-pages and contents of Vols. XII–XVI; from Mrs. M. A. Noble, 3 copies of officers' reports; from Mr. E. J. Winslow, 2 numbers of the Bulletin.

In connection with the meeting of the American Association for the Advancement of Science at San Francisco, an informal meeting of the Fern Society will be held at Berkeley in the rooms of the Herbarium, Hearst Mining Building, University of California, at 2 P. M., Monday, Aug. 2nd. At this meeting Professor and Mrs. Hall, Dr. Badè, and, it is hoped, Mr. S. B. Parish and Mr. H. H. Tracy will be present to welcome eastern members and to arrange for field excursions on which the local ferns may be seen in their haunts. Mrs. Hall writes: "Lest anyone be disappointed, I should like to say that 12 or 15 species are a good record here" for a day's trip. But all of them would be of interest to easterners. Mrs. Hall has very kindly undertaken to prepare a list of California ferns, with their localities, for the use of fern students travelling in the State and the specimens in the University herbarium may be consulted. The botanical excursions of the A. A. A. S. will be open to Fern Society members. Further information will be sent by the Secretary to all Pacific Coast members and to all others who will notify him of their wish to receive it.

In the East, a field meeting will be held in July, probably in the vicinity of Jamesville, N. Y. This region is the home of the hart's-tongue and of other unusual species, and is of the greatest interest geologically as well as botanically. Just now it has an especial appeal because the best localities for the hart's-tongue are threatened with destruction through the quarrying operations of a cement company and an active movement to preserve them as a State Park is in progress and is receiving the support of our local members. Exact details as to the meeting cannot now be given. Mr. James G. Scott, 123 West Price St., Germantown, Pa., is chairman of a committee to arrange for it and he will send definite information to all who will notify him that they think of attending.

One of the best known of American botanists, Dr. Charles Edwin Bessey, died at Lincoln, Neb., on Feb. 25, aged 69. Dr. Bessey was a graduate of the Michigan Agricultural College and a pupil of Asa Gray, and had been Professor of Botany at the University of Nebraska since 1884. He was for many years the botanical editor of *Science*, was a member and officer of many scientific societies and the author of a standard series of text-books and of numerous other books and articles, great and small. As a teacher of botany, he held an important place, not only because of his marked success in that work, but because in his earlier text-books he introduced into America ideas and methods which have led to present-day laboratory instruction. He was noted among his colleagues for his ready and kindly appreciation of the good in others' work; and he was a public-spirited citizen.

New Members—Mrs. Sidney Armer, 1329 Arch St., Berkeley, Cal.; Miss Louisa Blake, 50 West St., Worcester, Mass.; Prof. L. P. Breckenridge, 412 Humphrey St., New Haven, Conn.; Macy Carhart, Keyport, N. J.; Mrs. Orra Parker Phelps, Canton, N. Y.; Miss Maria F. Pratt, 4806 South Salina St., Syracuse, N. Y.; Paul C. Standley, Smithsonian Institution, Washington, D. C.; R. W. Woodward, 22 College St., New Haven, Conn.

Wanted—Specimens of the following species of the Ophioglossales, as listed in the North American Flora: *Botrychium pumicola, boreale, californicum, Schaffneri, Coulteri, pusillum, Jenmani, alabamense, Underwoodianum; Ophioglossum reticulatum, Harrisi, crotalophoroides, tenerum, californicum, Engelmanni; Cheiroglossa palmata.* I would expect to make fitting compensation. —ROBERT A. WARE, 246 Devonshire St., Boston, Mass.

Wanted—I will pay 10 cents per sheet for any North American pteridophytes not now in my collection, or will exchange. List of desiderata sent upon application. —L. S. HOPKINS, 525 E. Main St., Kent, Ohio.

American Fern Journal

Vol. 5 JULY—SEPTEMBER, 1915 No. 3

The Ferns of New Mexico

By E. O. Wooton and Paul C. Standley

The popular conception of New Mexico in the eastern and northern United States, often even among well educated people, is that it is nearly all a desert, where for most of the year high temperatures prevail. Very little is generally known, outside the State, of the large areas of agricultural land rendered productive by irrigation or by recently developed methods of dry farming, and still less of the great mountain ranges, best developed in the northern part, but reaching, as isolated masses of peaks, to the southern boundary. These ranges are similar to those of the states to the north and are fully equal in scenic effects to those of Colorado, so familiar to tourists. Some of the mountains of southern New Mexico, by reason of their precipitous, naked slopes, exhibit beauties of coloration which are unknown farther north. In the more elevated ranges in midsummer the climate is nearly ideal, although at altitudes of only 7500 to 8500 feet the temperature is often uncomfortably low. The highest peaks reach an elevation of slightly less than 14,000 feet, but scores of others, even near the Mexican and Texan border, are well above 10,000 feet.

While there is scarcely any part of the State where one is out of the sight of high mountains, the greater portion of its area of 122,000 square miles is composed

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[No. 2 of the Journal (5: 33–64) was issued May 27, 1915.]

of wide plains, having an altitude of from 3000 to 7000 feet, broken here and there by low hills. In southern New Mexico, at the lower altitudes, these plains support only a sparse vegetation, although even this furnishes forage to thousands of cattle; but in the northern part the plains are covered with grasses and other herbaceous vegetation characteristic of the Great Plains and the Great Basin.

If New Mexico were wholly arid one would expect its fern flora to be limited. The botanist acquainted only with the vegetation of the eastern and northern parts of the United States or that of the Pacific Slope, if he were seeking for ferns, would have hopes of finding at least a few in the higher mountains of the State. Strangely enough, most of our ferns are not found in the high mountains, but rather in the low arid ranges and foothills of the southern part of the State. The species which occur at higher altitudes are mostly those which have a wide distribution in North America, several of them extending to Eurasia. The fern flora of the arid mountains consists largely of species indigenous to the Southwest.

Ferns seem out of place in a xerophytic habitat, yet many of them grow nowhere else. A few miles southeast of Las Cruces is a low rounded mass of limestone known as Tortugas Mountain. Here, upon nearly bare, arid slopes, often among cacti, agaves, and other desert plants, grow five species of ferns. Several ferns are often associated with cacti in other places. Most of them are well fitted for existence in such situations by the thick texture of their fronds, which are often thickly covered with scales. In most cases the fronds, in arid locations, are involute or much shriveled under ordinary weather conditions, but when the summer rains fall they quickly unroll and growth again begins, although the period of moisture usually lasts for only a few days at a time.

The most interesting locality for ferns known in New Mexico is the Organ Mountains, near the Texan border. From this low, narrow range, only a few miles in length, none of whose peaks reach an elevation of 9,000 feet, twenty-three ferns and Selaginellas are known. This large number results partly from the fact that a great deal of collecting has been done in the region; but no doubt this range is exceptional in the State, especially in view of its small size. From the State as a whole forty-five ferns and fern allies are known, a number that compares favorably with the fern floras of most other states. In Rydberg's Flora of Colorado only forty species are listed. Doubtless Arizona possesses a larger number than New Mexico, for, when one considers the large number of diverse species discovered in that State in the last few years, it would seem that almost any North American species might ultimately be found there. It is remarkable that several characteristically northeastern ferns, such as *Dryopteris Dryopteris* and *Filix bulbifera* should occur in Arizona and not in New Mexico, which apparently lies in the natural path of their progress southwestward. There is still hope, however, that, when the mountains of our State have been more thoroughly explored, some of these species will be discovered.

1. POLYPODIUM HESPERIUM Maxon. A somewhat abnormal form of this species is known only from Brazos Canyon, Rio Arriba County.[1] It is possible that the same plant was collected also by Miss C. C. Ellis in the Sandia Mountains, but there is some doubt concerning the specimens, which are not now accessible.

2. BOMMERIA HISPIDA (Mett.) Underw. One of the characteristic ferns of the low arid mountain ranges. It is known from the Bear Mountains, Organ Mountains,

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[1] Amer. Fern Journal 4: 111.

Black Range, and Florida Mountains, and from Silver City. In the Organ Mountains it is very common, growing at the foot of granitic cliffs or boulders, or sometimes on protected slopes, usually in large colonies, and often intermingled with Selaginellas.

3. NOTHOLAENA BONARIENSIS (Willd.) C. Chr. [*N. ferruginea* (Desv.) Hook]. A species of wide distribution, extending, as the specific name indicates, as far south as Argentina. In New Mexico it has been discovered only in the arid Organ, Dona Ana, and Florida Mountains. It is found in the same environment as *Bommeria hispida*, the plants often forming large clumps.

4. NOTHOLAENA SINUATA (Sw.) Kaulf. Black Range, Bear Mountain, Carrizalillo Mountains, Big Hatchet Mountains, Florida Mountains, Organ and San Andreas Mountains, Tortugas Mountain, and Guadalupe Mountains. Reported also from near Las Vegas by Mr. Brandegee; but this record seems very doubtful, for the locality is far removed from the usual range of the species, in a very different floristic region. No other fern is better adapted to a xerophytic habitat than this, with its coriaceous fronds well protected by imbricated scales. On Tortugas Mountain, at an altitude of about 4000 feet, it receives not more than 8 or 10 inches of rain a year. Here it grows on parched limestone rocks, but in the Organs it is found about granitic cliffs.

5. NOTHOLAENA SINUATA INTEGERRIMA Hook. Black Range, Big Hatchet Mountains, Tortugas Mountain, Organ and San Andreas Mountains, Guadalupe Mountains, and Lakewood. In general appearance this is usually readily distinguishable, but, as pointed out by Mr. William R. Maxon, the form of the trichomes is essentially the same as in the typical form, consequently it cannot well be given specific rank. It differs commonly in its small, short, nearly entire pinnae and consequently narrower fronds. It ranges from western Texas to southern Arizona and northern Mexico, often growing

with the species. The differences in form do not appear to be the result of variations in environment, for on Tortugas Mountain, for instance, both grow under exactly the same conditions.

6. NOTHOLAENA STANDLEYI Maxon.[2] Common in nearly all the lower ranges from the Black Range and Socorro Mountain to the Dona Ana and Guadalupe Mountains, and southward. Reported also from Las Lagunitas, near Las Vegas, by Mr. Brandegee; but it scarcely seems possible that the species can be found in such a remote locality. This is one of the most characteristic and handsome ferns of the low, arid mountains, growing on both limestone and granitic rocks. Commonly, in the dry weather that usually prevails, the fronds appear shriveled, but in damp weather, or if placed in water, they quickly resume a plane form.

7. NOTHOLAENA DEALBATA (Pursh) Kunze. Big Hatchet Mountains, Black Range, Santo Domingo, Sandia Mountains, Burro Mountains, and Tortugas Mountain. Reported from Las Lagunitas near Las Vegas by Mr. Brandegee. Although it occurs in these widely separated localities, this is found only locally. It is very abundant on Tortugas Mountain, on very dry limestone rocks, but strangely enough it is not known from the nearby Organs. So far as known, this fern is confined to limestone in New Mexico.

8. NOTHOLAENA FENDLERI Kunze. Santa Fe, Sandia Mountains, Cimarron Canyon, and Socorro. Apparently this is very rare in the State, and neither of the writers has ever found it. The type was collected by August Fendler, probably somewhere about Santa Fe, in 1847. The species reaches the southern limit of its range in New Mexico, and is said to be more common in Colorado.

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[2] This name has been proposed recently for the fern known usually as *Notholaena Hookeri* D. C. Eaton. See, AMERICAN FERN JOURNAL, 5: 1. 1915.

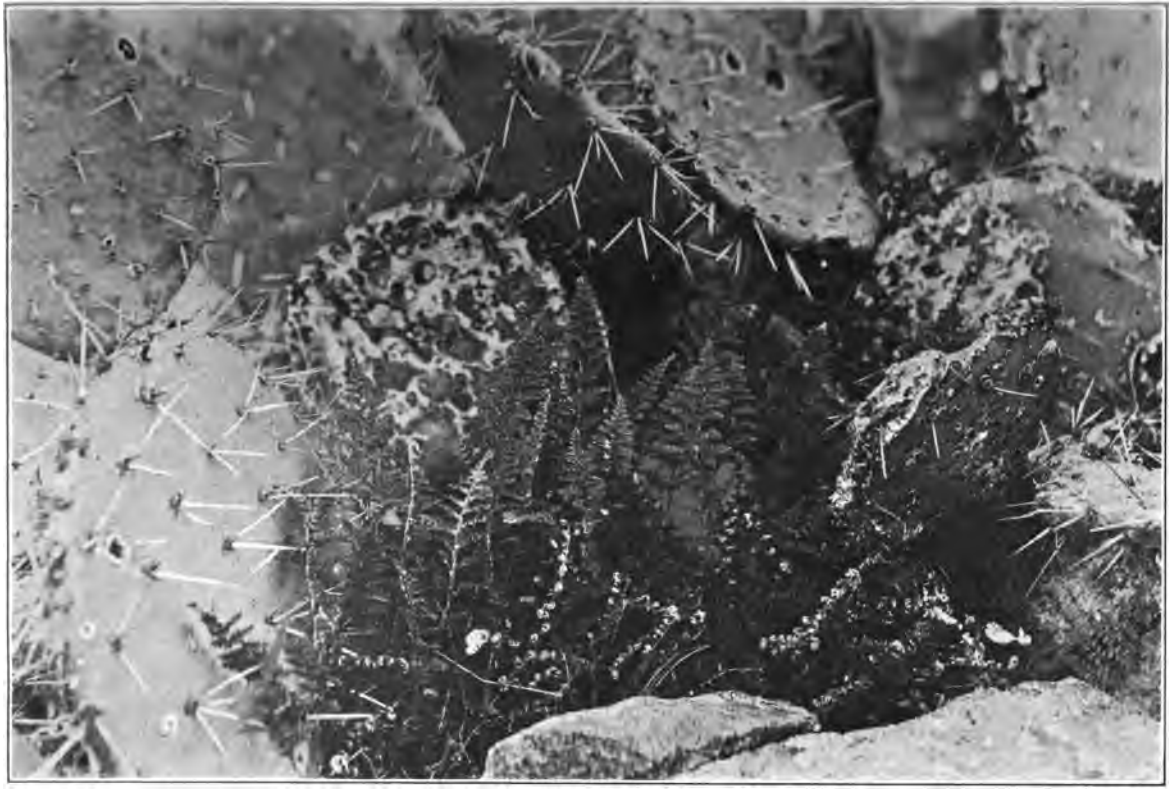
9. ADIANTUM CAPILLUS–VENERIS L. Known from only four localities: East Fork of the Rio Gila, in the Mogollon Mountains; Kingston; San Andreas Mountains; and a station eight miles northwest of Reserve, beside a warm spring. It is strange that this fern has not been found in the mountains of the northern part of the State, where conditions seem to be much better suited to its growth.

10. ADIANTUM MODESTUM Underw. The type was collected on the banks of South Spring River, near Roswell, by Prof. F. S. Earle (No. 261). It grows at a lower altitude than any other New Mexican fern, being the only one found away from mountains or hills. It is doubtful whether this is sufficiently distinct from *A. Capillus-Veneris* to deserve recognition as a species, and the question cannot be settled until the North American forms of that cosmopolitan fern have been more carefully studied. It is improbable that this form is confined to a single locality, but it has not been found elsewhere in New Mexico.

11. PTERIDIUM AQUILINUM PUBESCENS Underw. The pubescent form of the bracken grows in all the higher mountains of the State, often in great abundance, usually at altitudes of 7500 to 8500 feet.

12. CHEILANTHES WRIGHTII Hook. Of very local occurrence, being known only from the Telegraph Mountains (*Wooton*), Bear Mountains (*Rusby*), and Conde's Camp, near the southwest corner of the State (*Wright* 2128). In general appearance it is very unlike our other species of Cheilanthes, the fronds being bright green and glabrous. Southwestern New Mexico is probably the northeastern limit of the range of this species, which is more common in the dry mountains of southeastern Arizona.

13. CHEILANTHES FEEI Moore. Abundant locally, at middle or low altitudes in the mountains and hills



Cheilanthes Eatoni growing about an Opuntia, in the Organ Mountains nearly throughout the State. It is often found in very arid situations and usually, but not always, it grows on limestone, frequently in crevices of vertical or overhanging cliffs.

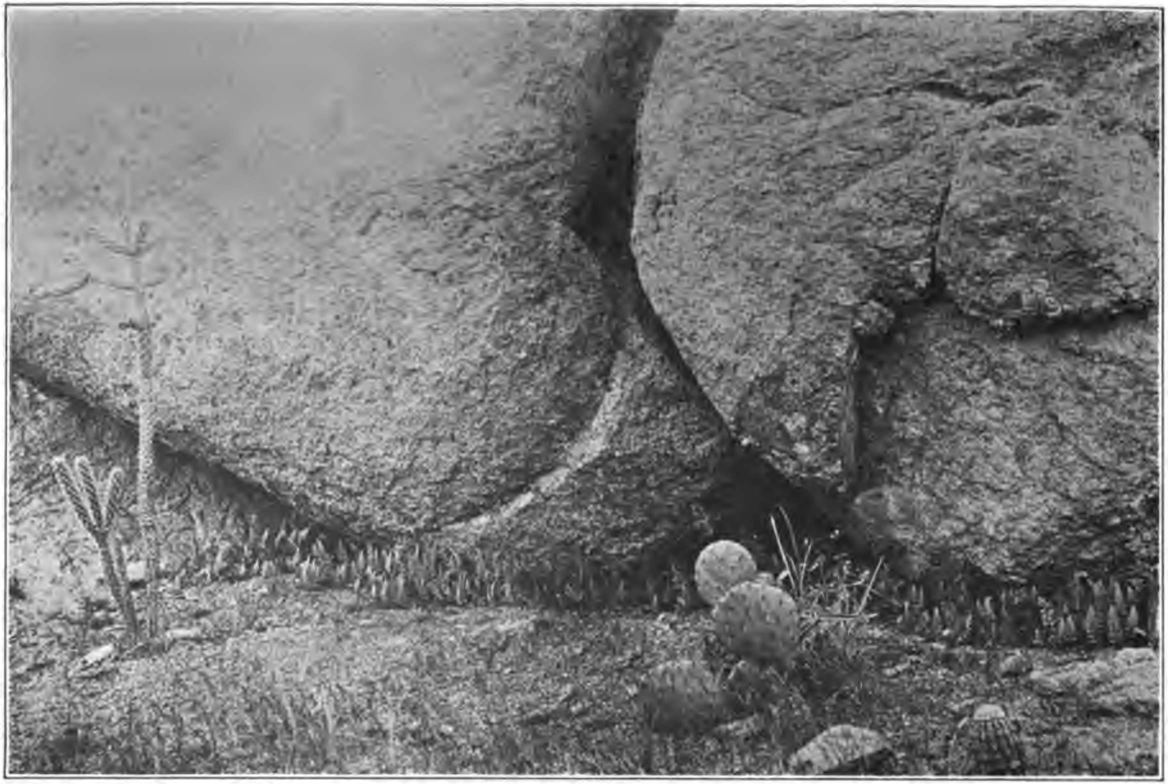
14. **CHEILANTHES EATONI** Baker. This unattractive fern has been collected in nearly all the mountain ranges in the State, except those in the northwest corner. In the Organ and Dona Ana Mountains it is found in arid situations at an altitude of not more than 6000 feet, but on San Mateo Peak and Hillsboro Peak it extends up to 9000 feet. It is probably more often met than any other species in the drier mountains of the State.

15. **CHEILANTHES FENDLERI** Hook. Frequent in most of the mountain ranges, extending up to 9000 feet in places. The type was collected by Fendler in 1847, somewhere about Santa Fe.

16. **CHEILANTHES MYRIOPHYLLA** Desv. Of local distribution, known only from the Black Range, Big Hatchet Mountains, the south end of the Organ Mountains, and the Sacramento Mountains, near Alamogordo (*Ferriss*). On Bishops Cap in the Organ Mountains it grows on limestone, in a very arid environment.

17. **CHEILANTHES LINDHEIMERI** Hook. Burro Mountains, Telegraph Mountains, Carlisle, Tres Hermanas, Florida Mountains, and Organ Mountains, at low altitudes. In the Organ Mountains it is very abundant, in the shade of granitic cliffs. It is perhaps our handsomest species of the genus because of the broad fronds of a rather peculiar color. Usually it grows in large colonies, the fronds standing perfectly erect.

18. **PELLAEA INTERMEDIA** Mett. Burro Mountains, Black Range, Tortugas Mountain, and the San Andreas and Organ Mountains. This is another fern of arid situations, growing usually on limestone. It is not as common as the number of localities might seem to suggest, never appearing very abundantly at any one station.



Cheilanthes Lindheimeri, with three species of cacti, in the Organ Mountains.

19. **PELLAEA SCABRA** C. Chr. [*P. aspera* (Hook.) Baker]. Known only from the "Copper Mines" (Santa Rita), a classic locality for New Mexican plants, where Wright and Bigelow collected the types of many common southwestern species. This fern was collected here by both these collectors, in the early fifties, but it has not been found in the State more recently.

20. **PELLAEA ATROPURPUREA** (L.) Link. Black Range, San Luis Mountains, Bear Mountain, Florida Mountains, Mangas Springs, Organ Mountains, Guadalupe Mountains, and on the highest point of the Llano Estacado. In the Organ Mountains it grows under thickets among granitic rocks, but elsewhere it usually frequents crevices and ledges of limestone cliffs.

21. **PELLAEA PULCHELLA** (Mart. & Gal.) Fée. Collected in New Mexico but once, in the Guadalupe Mountains near Queen (*Wooton*), in crevices of limestone rocks. This beautiful little fern is abundant in the region mentioned and is evidently very much at home.

22. **PELLAEA TERNIFOLIA** (Cav.) Link. Specimens possibly referable here were collected in the Organ Mountains by Wooton in 1891. It is possible that they are only a depauperate form of *P. mucronata*, for the species has not been found since in this range, although much collecting has been done there. Dr. Underwood reported it from Socorro (*Plank*), and Mr. M. E. Jones states that he found it at Silver City. The species is not uncommon in Chihuahua, and there is every reason for expecting it in New Mexico.

23. **PELLAEA MUCRONATA** (D. C. Eaton) C. Chr. [*P. Wrightiana* Hook.]. Sandia Mountains, Socorro, Santa Rita, Burro Mountains, Florida Mountains, and Dona Ana and Organ Mountains. Common at low altitudes. The type of *P. Wrightiana* was collected by Wright (No. 2130) at Santa Rita, or at least the Wright

specimens of the type number in the Gray Herbarium are from that locality. The species is quite common and is to be expected in most of the granitic mountains of the State in the oak and juniper zone.

24. CRYPTOGRAMMA ACROSTICHOIDES R. Br. Known only from Brazos Canyon, Rio Arriba County (*Standley*).[3]

25. ASPLENIUM SEPTENTRIONALE (L.) Hoffm. Known from Brazos Canyon (*Standley*), Cimarron Canyon (*Griffiths*), Sierra Grande (*Standley*), highest point of the Llano Estacado (*Vernon Bailey*), Santa Rita (*Wright* 2122), and Ben Moore, near Santa Rita (*Bigelow*). In crevices on the under side of rocks; probably not so rare as the records indicate, but overlooked by collectors.

26. ASPLENIUM RESILIENS Kunze. Rare in New Mexico, but known from Santa Rita (*Wright* 2121, in part), Florida Mountains (*Ferriss*), and Organ Mountains (*Wooton, Standley*). Growing in the Organs in crevices of granitic rocks.

27. ASPLENIUM TRICHOMANES L. Brazos Canyon, Santa Fe and Las Vegas Mountains, Mogollon Mountains, Santa Rita, and Organ Mountains. Usually at higher altitudes, on moist shaded cliffs.

28. ATHYRIUM CYCLOSORUM Rupr. Brazos Canyon, Upper Pecos River, and Mogollon Mountains, usually along water. Very rare on the Upper Pecos, but abundant in the other two regions. It reaches the largest size of any fern in the State.

29. DRYOPTERIS FILIX-MAS (L.) Schott. Brazos Canyon, Las Vegas Mountains, Ruidoso Creek in the White Mountains, and Organ Mountains, commonly in fissures of shaded canyon walls.

30. PHANEROPHLEBIA AURICULATA Underw. Probably this is the rarest fern of the State, for it is known from a single canyon in the Organ Mountains. Only

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[3] See Amer. Fern Journal 4: 112.

a few plants are found even here, growing in shaded soil about granitic cliffs. It is the northermost representative of a small genus, most of whose species are of much more southern distribution.[4] It is probable that the fern is doomed to extinction in New Mexico, for the locality where it grows is a favorite spot for picnics, and ferns in such a place always suffer.

31. FILIX FRAGILIS (L.) Underw. Perhaps our commonest fern, common in all the higher mountains of the State, but only in the higher ones. It is not known from any of the low ranges of the southwest corner.

32. WOODSIA MEXICANA Fée. Brazos Canyon, Upper Pecos River, Rio Pueblo, Sandia Mountains, Magdalena Mountains, Mogollon Mountains, Organ Mountains, Santa Rita, and White Mountains. On moist shaded cliffs, or rarely in exposed situations.

33. WOODSIA SCOPULINA D. C. Eaton. Brazos Canyon (*Standley*).[5]

34. WOODSIA PLUMMERAE Lemmon. Known only from the Burro Mountains, where it was collected by Dr. H. H. Rusby in 1881.

35. MARSILEA VESTITA Hook. & Grev. Collected in the Guadalupe Mountains, near Queen, by Wooton. It was collected by Wright in the vicinity of El Paso, Texas, not far from the New Mexican border.

[In the United States National Herbarium there is a specimen of *Marsilea uncinata* A. Br. obtained by one of the collectors of the Mexican Boundary Survey. The published report states that Dr. Bigelow collected the species somewhere in New Mexico. Although very small this specimen is probably correctly determined, and possibly the species should be credited to the State.]

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[4] See Underwood, Bull. Torrey Club **26**: 205-216. 1899; also Maxon, Bull. Torrey Club **39**: 23-28. 1912.

[5] See Amer. Fern Journal **4**: 112.

36. AZOLLA CAROLINIANA Willd. Obtained on Animas Creek in the Black Range by Mr. O. B. Metcalfe (No. 1110) in 1904. Probably it will be found in other localities if searched for carefully.

37. EQUISETUM ARVENSE L. Chama, Brazos Canyon, Taos Mountains, Upper Pecos River, Zuni Mountains, and Mogollon Mountains. Often very abundant along streams in the higher mountains.

38. EQUISETUM LAEVIGATUM A. Br. Common in most of the higher mountains, along streams and in the "ciénagas" or marshes. It has been collected also in the Mesilla Valley, at an altitude of 3800 feet, and near Albuquerque.

39. EQUISETUM HYEMALE L. Gallinas River near Las Vegas (*Cockerell*), Reserve (*Wooton*), along the Rio Grande near Mesilla (*Standley*), Gilmores Ranch in the White Mountains (*Wooton and Standley*). Sometimes growing along banks of irrigating ditches. Our material belongs to the form described as *E. hyemale intermedium* by Mr. A. A. Eaton.

40. EQUISETUM ROBUSTUM A. Br. Mogollon Mountains (*Rusby* 416) and along ditch banks near Mesilla (*Wooton* 38).

41. SELAGINELLA RUPINCOLA Underw. San Luis Mountains, Dog Spring, Guadalupe Pass, and Organ Mountains. The type was collected in the Organ Mountains by Wooton (No. 124) in 1897. It is abundant in the range, forming large mats on granitic ledges.

42. SELAGINELLA DENSA Underw. On the Upper Pecos near Winsor's Ranch (*Standley* 4153), and on Hillsboro Peak of the Black Range (*Metcalfe* 1172). This was found in only one locality on the Upper Pecos, growing on an exposed ledge at an altitude of about 8300 feet.

43. SELAGINELLA WRIGHTII Hieron. Collected at Las Vegas (*Plank* in 1895) and at Lakewood (*Wooton*

in 1909). The specimens from Lakewood grew on gypsum soil, alongside a new species of Eriogonum lately described by the writers as *E. gypsophilum.*

44. SELAGINELLA MUTICA D. C. Eaton. Pecos (*Standley* 5199), Ojo Caliente at the head of Canada Alamosa (*Wooton*), Florida Mountains (*Ferriss*), and Organ Mountains (*Bigelow, Wooton, Standley*).

45. SELAGINELLA UNDERWOODII Hieron. [*S. rupestris Fendleri* Underw.]. Santa Fe and Las Vegas Mounttains, Brazos Canyon, Ramah, Folsom, Mogollon Mountains, Black Range, Organ Mountains, White Mountains. Our most widely distributed species, often very abundant. The type was collected near Santa Fe, by Fendler. This and the preceding species, together with *S. rupincola*, are very abundant in the Organ Mountains, on shaded cliffs or ledges, the three growing together, often in the same mats. During the dry season the plants are dormant, with the leaves closely appressed; but when the rains come in July, August, and September, the leaves quickly take on a greener hue and spread from the stems.

A single specimen in the United States National Herbarium of a species allied to *Selaginella arenicola* Underw. purports to come from Las Vegas. There is considerable doubt, however, whether the label is correct, and we prefer to neglect this record until it is substantiated by another collection.

The Resurrection plant, *Selaginella lepidophylla*, will probably be found sometime in southern New Mexico, perhaps in the Guadalupe Mountains, for it is known to grow in Texas, not far from our southern border.

Impressions of the Ferns of Porto Rico

AGNES CHASE

On a first visit to the West Indies a botanist of the northern United States would be most impressed, I think, by the palms and ferns. In the fall of 1913 the writer spent about two months in Porto Rico studying and collecting the grasses of the island. The ferny by-products of this trip have proved to be of some interest.

Save a narrow strip along most of the coast Porto Rico is all hills and hollows. Except along the dry south coast, ferns are in evidence almost everywhere from sea level to the highest summits, becoming more plentiful the greater the altitude. My first day in the highlands was October 23 at Maricao, which we reached about half-past seven, after two hours' ride up the winding road through the cool morning mists, past coffee and banana groves, the roadside banks in places completely covered with ferns. After café at the fonda we set out, following up the Rio Maricao, scrambling over the rocks and in and out of the water most of the way. Maricao is 1500 feet high and we ascended some five hundred feet only in the five or six miles we made up river. The beauty of that rocky stream of clear rushing water, its banks hung with strange trees and shrubs and gorgeous flowers, with ferns everywhere they could find a foothold, on rocks, on the trunks and branches of trees, was intoxicating. I met my first tree ferns here. One, some 25 feet high, a species of Alsophila, was collected in fruit. It has fronds six or eight feet long, the stout woody stipes beset with spines like a blackberry cane. On its trunk were growing *Polypodium asplenifolium* L., its long narrow fronds drooping over on their slender fuzzy stipes, and *Trichomanes* *scandens* L., a lovely filmy with lacy fronds twelve to fifteen inches long. Two other filmies, *Hymenophyllum polyanthes* Sw., with lacy fronds six to ten inches long, and *Trichomanes arbuscula* Desv., with erect, tufted, relatively dense fronds two to four inches high, the latter in turn affording foothold to a minute liverwort, were also collected here. Three species of *Elaphoglossum* with entire fronds, the fertile ones smaller and soft pinkish brown, found space on the tree trunks; also *Polypodium piloselloides* L. and *Rhipidopteris peltata* (Sw.) Kaulf., with solitary fronds evenly spaced along slender wide-creeping rhizomes which cling by numerous rootlets to the tree, weaving in and out among the other occupants. The *Rhipidopteris* has sterile fronds in shape much like an attenuated leaf of *Viola pedata*. The fertile fronds, raised on long stipes, are little peltate affairs about half an inch across. It is surprising how many species and individuals can find accommodation on one tree trunk. A single tree may bear several species of ferns, big and little, various orchids, peperomias, and bromeliads. *Polystichum adiantiforme* (Forst.) J. Sm., with great fronds two to three feet long, spaced upon a twining, chaffy, rope-like rhizome, was perched high up on a trunk along with its small relatives. Two other species of *Polypodium* also were collected: *P. angustifolium* Sw., with long, narrow, simple, leathery fronds, and *P. duale* Maxon, a very delicate little moss-like plant with tiny saw-toothed fronds like a fairy's scroll saw. *Pteris altissima* Poir., even more gigantic than our own brake, grew on the banks of the Maricao.

The following day I made a trip to Monte Alegrillo, reaching a higher altitude, and seeing mountain palms and more tree ferns, especially the common, but none the less lovely, *Cyathea arborea* (L.) Sm., with great plumy fronds and a nest of fiddle-heads, three or four feet long. On an open grassy hilltop overlooking the southwest corner of the island I collected *Botrychium Jenmani* Underw., the first record of this species from Porto Rico. I rejoiced more, however, over finding here in abundance the hitherto little known *Paspalum portoricense*.

The higher mountains, rich in quality, but poor in quantity of grasses, afforded time for collecting ferns which were always abundant where grasses were scarce. Filmy ferns were found on all the dense moist forested upper slopes. A species of Trichomanes with fronds about a quarter of an inch long was found on moist rocks by a waterfall on the Arecibo road to Utuado, but nowhere else. Alta de Bandera, east of Adjuntas, was the ferniest place I have yet seen, with the possible exception of El Yunque. Three species of *Hymenophyllum* were here, two with tiny fronds suggesting thalli of *Riccia fluitans* strung along a thread, the other *H. microcarpon* Desv., with fronds three to six inches long. With these were *Trichomanes scandens* the lovely, *T. crispum* L., and *T. capillaceum* L., the latter a species with fronds emaciated to the last degree, with nothing left of them but the nerves—all fairly common on the wet, jungly mountain side. *Asplenium Serra* L. & F., *A. salicifolium* L., *A. cristatum* Lam., *Diplazium arboreum* (Willd.) Presl., and *Vittaria lineata* (L.) Smith were also found here. *Olfersia cervina* (L.) Kunze with large pinnate sterile fronds, with entire firm pinnae as much as eight inches long and two inches wide, and bipinnate fertile fronds reduced to a skeleton, was strikingly unlike anything I had ever seen before. But the strangest fern I ever saw was *Hymenodium crinitum* (L.) Fée, with a cluster of sterile fronds in shape and size like the leaves of skunk cabbage. The fertile frond is of like shape, but much smaller, about six inches long. The stipes are densely clothed with coarse black hairs.

These hairs (or more properly scales) with enlarged bases and attenuate tips are sparsely scattered over the under surface of the sterile frond. Facing in all directions they look absurdly like infant tadpoles with their enlarged heads and long wavering tails.

On El Yunque, in the luxuriant mountain palm forest, every stump and tree and stone was covered with ferns. In one slightly open spot was a lovely grove of tree ferns, the finest I saw anywhere. Among species I had not before collected were *Polypodium cultratum* Willd., *Trichomanes rigidum* Sw., *Vittaria remota* Fée, and a species of *Pleurogramma,* the latter resembling *Vittaria,* but with the sporangia down the center instead of along the margins. A beautiful *Selaginella* found in most of the wet forests was abundant here.

Most of the *Lycopodiums* of Porto Rico are very different from any of our species. *Lycopodium reflexum* Lam., found growing on wet rocks on Alta de Bandera, reminds one of *L. lucidulum,* but the other species, growing high up on trees and hanging in great tassels two or three feet long appear strange to northern eyes. *Lycopodium linifolium* L. and *L. taxifolium* Sw. have linear leaves half an inch to an inch long, crowded and imbricate in the second species. In *L. aqualupianum* Spring the crowded leaves are elliptical, about a centimeter long, the slender terminal fertile branches with small scale-like leaves. *Lycopodium setaceum* Lam., a common species, has minute, oblique, scale-like leaves throughout, these lax, but resembling those of our own *L. clavatum.*

Polystichum rhizophyllum (Sw.) Presl, with the habit of our walking fern, is found about mountain passes in the center of the island.

On the limestone cliffs of the northern and western coast the ferns were mostly those with compact habit and more or less leathery fronds. In pockets in limestone cliffs, somewhat sheltered by brush, grew *Sphenomeris clavata* (L.) Maxon, well named, for the sterile pinnae are wedge-shaped and the fertile club-shaped. *Anemia adiantifolia* (L.) Sw. and *Asplenium dentatum* L. grew in like places.

Polypodium exiguum Hew. and *Adiantum melanoleucum* Willd. grew in shaded places on the limestone cliffs. A peculiar fern ally, suggesting *Gnetum* in appearance, *Psilotum nudum* (L.) Griseb., braved the sun on the open cliffs.

Seed-bearing Ferns.

BY F. H. KNOWLTON,

United States Geological Survey

The prevailing belief of three centuries ago as regards the mysterious process supposed to surround reproduction in ferns was well voiced by Shakespeare when he says: "We have the receipt of fern seed; we walk invisible."

Now, since the compound microscope and an improved technique has put us in the possession of the intricate details of reproduction and development in the ferns, it is not much to be wondered that it then seemed so shrouded in mystery. But, complicated as the process is known to be, it is only a step in the history of the evolution of the great group of ferns.

Until a few years ago we rested secure in the belief that the dominant types of living plants—the flowering plants—were dominant because they had developed the seed-bearing habit. Within the past dozen years, however, it has been demonstrated that in the oldest land flora of which we have any knowledge, namely, that which lived in early and middle Devonian time, there was a great group of plants, which, while still retaining the fern-like foliage, had already developed the seed-bearing habit in a high degree of perfection. This group, now known as the Cycadofilices, or better as the Pteridosperms or "seed-bearing ferns," is the subject of this brief note.

Until a few years ago the Paleozoic era used to be called the "Age of Ferns," on account of the obvious dominance of this type of vegetation. While these "ferns," as they were supposed to be, were extremely abundant and exhibited great diversity in form and size, it was always a matter of wonder as to why so few showed the presence of sori. As the vast majority were apparently sterile, these had to be aggregated in "form" genera, or so-called genera of convenience, but always with the hope that some time the fruiting state might be discovered. As we no look back, it is recalled that certain seeds were often found preserved in the same beds with the fern-like foliage, but the idea that there could be any connection between them was unthought of. These seeds were supposed in large part to belong to the Cordiatales, a large group of mostly tree-like plants which show kinship with the living cycads, conifers, and ginkgos.

In 1903, however, Prof. F. W. Oliver announced the astonishing discovery that the little seeds known as *Lygenostoma Lomaxi* were produced by the well-known "fern" from the English Coal Measures known as *Lyginodendron Oldhamium.* This discovery of course stimulated investigation with the result that *Lyginodendron* is probably the most completely known fossil "fern," though it had taken nearly a hundred years, as now turns out, to get the whole story. The foliage was named and described in 1829 under the name of *Sphenopteris Hoeninghausi;* the stem was named in 1866 as *Dadoxylon Oldhamium,* but was transferred to *Lyginodendron* in 1872; the roots, under the name of

Kaloxylon Hookeri, were named in 1876; the petioles as *Rachiopteris aspera* in 1874; the seeds, known as *Lagenostoma Lomaxi*, in 1903; while the pollen-bearing organs, called *Calymmatotheca Stangeri*, were not recognized as belonging to this remarkable plant until 1905.

We are now in position to draw a fairly complete picture of the plant as it must have appeared when living. It was in effect a little tree fern, with long, slender, sometimes branched, stem 4 cm. or less in diameter, and provided with spines by means of which it probably climbed on its neighbors. The foliage was disposed spirally and consisted of relatively very large, finely divided fronds with small, thick pinnules with revolute margins, suggesting a xerophytic or halophytic habitat. The stem in the lower portion gave rise to numbers of slender roots, some of which appear to have been aerial in their origin. These grew downward and often branched where they entered the soil.

The stems, roots, and petioles, and even the pinnules, have been found silicified and so beautifully preserved that their entire structure can be made out with certainty. Without going into a technical description of these organs, it may be said that the stem when young, and before secondary growth has begun has a very strong resemblance to the stem of *Osmunda*, but when more mature certain cycadean characters appear to predominate. The roots when young are marattiaceous in character, but after secondary growth has been inaugurated they assume the well-known character of gymnospermous roots.

The most interesting feature of this plant was, of course, the seeds. Beyond the fact that they were a part of a pinnule, as is shown by the structure of the pedicel, the exact manner of their attachment is not known. The seed itself was a little acorn or barrel-shaped structure about a quarter of an inch long, and was borne in an open cupule somewhat as is a hazel nut in its involucre. The cupule is studded with capitate glands exactly like those borne by the fronds and stems of *Lyginodendron.*

As already mentioned the seeds are silicified and retain most of their structure so well preserved that almost every part can be studied. The following description is by Dr. D. H. Scott, President of the Linnaean Society of London: "The seed itself is orthotropous and generally of cycadean organization; it shows complete radial symmetry. * * * It consists essentially of a central body or nucellus, enclosed in a seed-coat; these two parts closely united together except at the top. It will be remembered that in modern cycads and in the maiden-hair tree (Ginkgo) there is a hollow chamber in the apex of the nucellus serving to catch the pollen-grains. The same arrangement is present in the seed of *Lyginodendron,* and pollen is still found in the pollen-chamber; the latter, however, is less simple than in living cycads, for a column of tissue rises up in the middle of the chamber, leaving only a narrow space around it for the reception of the pollen. It is interesting to find that the mouth of the pollen-chamber projected a little through the micropyle, so that it received the pollen directly instead of the grains having to traverse the micropyle first."

The last chapter in this fascinating history was the finding of the pollen-bearing or male organs. It appears that on the same fronds which bear the ordinary vegetative leaflets, there are certain fertile pinnules which bear a number of oval discs 2 or 3 mm. in length. On the under side of each disc there are from 4 to 6 two-chambered, spindle-shaped pollen-sacs, and pollen-grains were actually found in them. Until these pollen-bearing organs were found in organic connection with foliage of *Lyginodendron* there was nothing to suggest that they belonged to seed-bearing plants; in fact, they were supposed to belong to marattiaceous ferns.

The more or less complete life history of a number of other pteridosperms is now known, and from these it appears that there was considerable diversity not only in the form of the seed but in the manner in which it was borne on the plant. Thus, from the Carboniferous (Pottsville beds) of West Virginia, Mr. David White has described a plant under the name of *Aneimites fertilis*, which bore small, winged, rhomboidal seeds on the apices of reduced terminal pinnae. However, lack of space forbids further description of this and other forms.

It is evident from what has preceded that we are not dealing with ferns at all, but veritable seed-plants. It is probable that less than half of the Paleozoic "ferns" will ultimately be shown to be true ferns.

Ferns of the Wissahickon Valley

EDWIN C. JELLETT

(Address delivered at the Philadelphia meeting of the Fern Society, December 29, 1914.)

I shall endeavor to speak, not of ferns, but of where ferns grow in the Wissahickon district.

To our local members present Wissahickon Creek is well known, but for the benefit of visitors it may be well to state it is a beautiful, romantic, historic stream, which rises in Montgomery County, Pa., and for 22 miles flows in a general southwesterly direction to the Schuylkill River, with which it unites south of Manayunk. For 16 miles this stream meanders through a picturesque open territory to Chestnut Hill, where it enters a great, tortuous, longitudinal ravine, connecting with many secondary lateral ravines, accommodating streams, and for 6 miles, as part of Fairmount Park, it struggles onward over dams, between precipitous, rocky hills clothed by sweet-fern, wild honeysuckle, and laurel—by juniper, pine, and hemlock—by oak, chestnut, and tulip-poplar—shrubs and trees of unusual size and vigor—with an exceedingly rich floral undergrowth —until it finds its release at "Riverside."

From colonial days "the Wissahickon" has been a resort for nature-lovers, and upon its northern bank near Ridge Road John Kelpius in 1695 founded and conducted what is believed to have been the first Botanic Garden of America. Here plants were grown and their uses taught, and from it Dr. Christopher Witt proceeded to Germantown, where, in 1705, the second garden for the study of plants was established.

Philadelphia being the important city of America until after the Revolutionary War, in it, first in the United States, the study of the natural sciences became popular, and, in connection with the Philadelphia College, the Academy of Natural Sciences, and other institutions of learning, teachers and their classes made frequent excursions and became familiar with the Wissahickon territory. From records existing it is of interest to note changes. Dr. W. P. C. Barton, in his Compendium Florae Philadelphicae,. published in 1818, noted that *Viola rotundifolia* "is rare and grows only upon Wissahickon-hills near Ridge Road," while now it appears two miles northwest upon the stream. Here C. S. Rafinesque was a frequent visitor, and from here, near Schuylkill Falls, Thomas Nuttall, in 1818, described *Asplenium pinnatifidum.* It would be difficult to name a Philadelphia botanist not connected with "the Wissahickon," for, from the days of Kelpius to those of Stone and Brown, all known to us were familiar with it. Upon its banks flourished the nurseries of Maupay, Meehan, and Andorra, and here, at Kieffer's nursery, was born the celebrated Kieffer pear. Indeed, the whole region is so rich in botanical lore and treasure that it is difficult to pass its many charms.

In the Wissahickon district, there are, so far as known to me, 38 varieties of ferns, which here, as elsewhere, frequent situations favorable to their growth, and are so generally distributed that one with confidence may go to a habitat and collect the fern he desires. In low grounds and along fences, *Onoclea sensibilis* is common, while the var. *obtusilobata*, its abnormal product, is infrequent, though not exceedingly rare. In damp places or in open woods appears *Dicksonia pilosiuscula*, and in deep, well drained mould *Phegopteris hexagonoptera* is not uncommon. Common everywhere in protected dry places is *Aspidium noveboracense* and *Asplenium ebeneum*, while more rare is *A. angustifolium*. On ledges, on the under side of shelving rocks, and in caves, *Asplenium Trichomanes* is not uncommon. Along swampy rivulets is *Aspidium Thelypteris* and *Athyrium thelypteroides*. Nowhere in Maine did I see a more beautiful hill of *Pteris aquilina* than appears upon the east side of Creshiem Creek, near "Devil's Pool." Near the same place, also upon stone walls and upon rocks, appear *Cystopteris fragilis*, *Woodsia obtusa*—and, it is said, *Woodsia ilvensis*, although the latter I have not collected. Everywhere in Wissahickon woods upon micaceous rocks *Polypodium vulgare* is common, while upon steatitic rock in both upper and lower Wissahickon woods appears sparingly *Camptosorus rhizophyllus*. Also upon rocks, near Ridge Road, are, or were, *Asplenium pinnatifidum*, *Pellaea atropurpurea*, and *Cheilanthes vestita*. Here also has been collected *Asplenium Ruta-muraria*, but I have not been fortunate enough to collect it myself. A fern peculiar to the district grew near Allen's Lane. This was *Athyrium Filix-femina*. It grew upon a shelving elevation, and, as it is several years since I visited the spot, it may have disappeared. For a knowledge of its hiding-place I am indebted to Joseph Meehan.

Everywhere throughout "the Wissahickon" appears *Polystichum acrostichoides*, while near Springfield Avenue grow *Aspidium marginale, A. spinulosum, A. cristatum,* and *A. Goldianum.* Nearby also appears a solitary group of *Woodwardia angustifolia.* Upon "Paper-mill Run" are, or were, *Osmunda regalis, O. cinnamomea,* and *O. Claytoniana.*

I have now named our best-known ferns, some of which are very common, others being rare—although all may be common to another locality. Among those rare with us is *Lygodium palmatum,* a single station of which in Wissahickon is near "Old Red Bridge." *Adiantum pedatum,* once with us very common, is now rare and only sparingly appears throughout the district. Perhaps the rarest fern now appearing near Wissahickon is *Struthiopteris germanica,* confined to one station and appearing out of place, for one usually thinks of it in connection with the *Woodwardias* and *Schizaea* of New Jersey. The locality was made known o me by George Redles. In many places appear the *Botrychiums,* the most common being *B. virginianum,* while close behind is *B. ternatum,* with its varieties *intermedium* and *dissectum,* for I hold the last two as but varieties of the first, produced by check, and which, like *Onoclea sensibilis,* var. *obtusilobata,* may be produced at will.

Variations bring us to hybridization and our most interesting fern, which was described from Roberts's Run, almost directly opposite the mouth of Wissahickon Creek, and is known as *Asplenium ebenoides.* This was discovered by the father of our worthy chairman, who was Robert Robinson Scott, and in the year 1862. For many years this district had been visited by a coterie of Darby-Road botanists, composed of William Hobson, William DeHart, Robert Kilvington. Thomas Meehan, and others, but the "find" was made by Mr. Scott, who noted the dual character of the plant in his first report of it to the Pennsylvania Horticultural Society, which later appeared in the columns of the Gardeners' Monthly. From the date of its first report until now, and in spite of experiments and demonstrations by Miss Slosson and others, the plant yet continues a "bone of contention," and I know not a better subject to start an argument among botanists than to assert that it is, or is not, a hybrid. As I wish not, at this time, to start a discussion, I shall conclude by stating that the "Fern Flora" assigned me is but a small part of the wonders of the region, and I trust that, when again our members meet in Philadelphia, a day will be reserved and that you will ask me to guide you through our wondrous Wissahickon.

GERMANTOWN, PA.

Notes and News

A REVIEW: W. R. MAXON. THE NORTH AMERICAN SPECIES OF PSILOGRAMME.[1]

Psilogramme is a genus of tropical ferns belonging to the tribe *Pteridiæ*, and is one of the groups formerly included under the omnibus generic name of *Gymnogramma*. In the present paper eight species are dealt with, of which three are new, all from Mexico or Central America. Besides these eight there are two species which have been called *Psilogramme* but which are here considered as of doubtful relationship to the others.

R. C. B.

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[1] Bull. Torr. Club **42**: 79–86. Fe 1915.

OF INTEREST TO FERN GARDENERS. A catalogue of one of the largest florist companies of the country lists twenty-nine species and varieties of hardy ferns. Of these less than half are native, the remainder being European and Japanese. The foreign list includes horticultural varieties of lady fern and hart's tongue, species of *Dryopteris* and *Polystichum*, and the Japanese variegated lady fern, *Athyrium Goringianum pictum*.

The list in many cases uses obsolete nomenclature but there need be no doubt as to the fact that the ferns listed are different in many cases from our native species and would make attractive additions to any hardy fern garden. The writer has seen them growing as thrifty good sized plants. An interesting point is the use of an attractive and appropriate common name for *Dennstaedtia* which is called "gossamer fern," surely more accurate than "boulder fern," and more euphonious than "hay scented fern."

Members interested in getting any of these ferns are requested to send to R. C. Benedict each an unused post card with their name and address on the correspondence side, and a request for a catalogue. These will then be forwarded to the florist. This method is taken that the Journal may receive credit for any orders sent in.

The twentieth anniversary of the founding of the New York Botanical Garden will be commemorated at the Garden during the week commencing September 6, 1915. Botanists from all parts of North America are invited to attend. The program includes two days' sessions for the reading of papers and the inspection of the grounds and buildings of he Garden, a visit to the Brooklyn Botanic Garden and excursions to Staten Island and to the pine-barrens of New Jersey.

American Fern Society

In accordance with the requirements of the Constitution, I have appointed the following members a committee to make nominations for officers for the year 1916: Miss Nellie Mirick, Mr. Robert A. Ware, and Rev. James A. Bates.

C. H. Bissell, *President*.

The Summer Meetings.—The present number is issued especially early in order that the final plans for the Central New York field meeting may be thoroughly known. The meet will be held July 13–16, with headquarters at the Mizpah Hotel, Syracuse, N. Y. Visiting members may stop at any of the downtown hotels, of which there are several good ones, or arrangements can be made for rooms at lower rates in the University section provided application is made beforehand to R. C. Benedict.

The first meeting planned is an informal reception to be held at the home of Mrs. Wm. Spalding, 405 Comstock Ave., at 8 P. M., Tuesday, July 13, to which invitation is hereby given. At this time the actual plans for the field trips will be thoroughly discussed and the evening will also give a good chance for members to get well acquainted. Those who expect to be present are requested to send a word to Mrs. Spalding.

The first trip will take place the following morning. The route will be by way of a Suburban R. R. trolley car for Jamesville, leaving the downtown terminal at 8:30 A. M. Bring lunch. The main object of the whole meeting is to visit the Green Lakes region near Jamesville. These lakes (there are two) are famous geologically as representing the plunge basins of former glacial waterfalls comparable with Niagara. Today they are small bodies of water surrounded on three sides by steep rubble banks and cliffs several hundred feet high. The lakes are also famous as harboring in their environs the best stations in North America for the hart's tongue fern. Tennessee has a few small plants; Ontario, Canada, has a few more, as described by H. E. Ransier in an early JOURNAL. In the Jamesville region it will be possible for members to see and collect leaves (not plants) in considerable quantity and of good size.

Besides the hart's tongue it will probably be possible to see in the same section the slender cliff brake, purple cliff brake, adder's tongue, the Onondaga grape fern (*Botrychium onondagense*), the oak-fern, Goldie's fern, and other species of *Dryopteris*. Of special interest will be the possibility of rediscovering the original plant of the hybrid, *Dryopteris Goldiana* × *intermedia*, which is known only from its original discovery in this region and which is the most striking of all the hybrids, a tall-growing black-scaled plant of *Goldiana* habit with the cutting approximating that of *intermedia*. *D. Goldiana* × *marginalis* has been found near one of the lakes at least twice.

One of the two lakes has, with seventy-five acres surrounding, been recently presented to the State as a park, and is known as the Clark Reservation in honor of its donor. There is now under way in Syracuse, with strong prospects of success, a movement to have the other lake with seven hundred and fifty acres set aside also as a state preserve in order to protect both its geological and its botanical features. If this is not done there is immediate danger that the land may be purchased and developed by a lime company.

Three days will probably be spent about the lakes. Other trips can then be arranged if desirable. We expect all the Central New York members to be there with a good representation from New England, New York, and Pennsylvania, and, we hope, other sections.

Members who are in California this summer should not fail to attend the Society meeting at the Herbarium of the University of California, Hearst Mining Building, Berkeley, at 2 P. M., Monday, August 2. A notice of it appeared in the last number of the JOURNAL.

A pleasant fern meeting was held at Worcester, Mass., on May 8, in the rooms of the local Natural History Society, to whom, and especially to their curator, Mrs. Horr, thanks are due. About 25 persons were present. Mr. Jackson welcomed the visitors to Worcester, pointing out, among other things, that that city has one member of the Fern Society to every 50,000 of its inhabitants and that if the same ratio were maintained throughout the United States, the Society would number 1,800—a millenial condition. Short talks on various subjects of interest to fern lovers were given by Miss Rowe, Miss Marshall, and Messrs. Bissell, Ware, and Winslow, and there was a liberal display of specimens, local and exotic. It is, not for the first time, earnestly recommended that members in other parts of the country get together for similar local meetings. They are worth the trouble.

New members—Dr. James H. Barr, Yuba City, Cal.; Mrs. L. P. Breckenridge, 412 Humphrey St., New Haven, Conn.; Mrs. Mary Flannery, 608 D St., Marysville, Cal.; Charles N. Forbes, Bishop Museum, Honolulu, H. I; Miss Daisy Levy, 403 West 115th St., New York City; Johannes Reimers, 2637 Rose St., Berkeley, Cal.; Mrs. Herbert S. Utley, 299 Blue Hills Ave., Hartford, Conn.; Miss Mary L. Utley, 301 Blue Hills Ave., Hartford, Conn. Change of address—Rev. H. G. Limric, Apartado 221, Sagua la Grande, Cuba. The name of one of our new members, Mrs. Charles Pratt, 4806 South Salina St., Syracuse, N. Y., was given, by mistake, as Miss Maria F. Pratt in the last number of the JOURNAL. Through another error, the name of Miss M. A. Marshall, Still River, Mass., was omitted from the printed list of members.

Mrs. M. A. Noble has generously added to her former gift the four numbers of Vol. V of the Fern Bulletin. This gives the Society a complete set up to and including Vol. XI.

The Brooklyn Botanic Garden will build special fern beds to house a Society fern garden if members will send in the plants. Let us start it now. Send in any rarities which are in danger of destruction.

In response to a suggestion of Dr. Benedict's in a recent number of the JOURNAL, Mrs. D. S. Hartline, State Normal School, Bloomsburg, Pa., writes that she has a successful fern garden and would be "only too happy" to receive any living plants to add to her collection and would pay postage on them.

Rev. James A. Bates, South Royalston, Mass., offers for sale unmounted herbarium specimens, partly ferns, at $5 per hundred. Write to him for further particulars.

A member asks where living ferns of the Southwest can be obtained. Write the Carnegie Experiment Station, Tucson, Ariz. They can put you in touch with some reliable dealer.

MESSRS. WARE AND BIGELOW AT THE HOME OF ASPLENIUM EBENOIDES, BERLIN, CONN.

American Fern Journal

Vol. 5 OCTOBER–DECEMBER, 1915 No. 4

The southern California Ferns[1]

S. B. Parish

While California is a narrow state, measured across from east to west, it is a very long one, measured from north to south. On the Pacific coast it occupies the same degrees of latitude as does the whole row of states between Boston and Charleston on the Atlantic seaboard. And there is no other tract of equal size on the North American continent which can compare with it in topographical and physical diversity. All altitudes, from 14,000 feet above sea level to nearly 300 feet below it; a wide range of temperature, from many degrees below zero to 140 degrees above; all amounts of precipitation, from at least 80 inches per annum to none at all. Such a diversity of environment would lead one to expect an extensive fern-flora, but the fact is that the combinations are not suited to produce such a development. If the redwood belt, the part of the state which is soaked in rain and blanketed with fogs, had the temperatures of the Colorado and Mojave deserts, or if the transfer were reversed, and the northern rains and fogs were brought down to the hot, but arid south, what a land of ferns California would be! Even if the total moisture were evenly distributed over the whole state, and the varied temperatures averaged throughout its whole

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[1] **Read at the meeting of the Fern Society, at Berkeley, California, August 2, 1915.**

[No. 3 of the Journal (5: 65–96) was issued July 10, 1915.]

extent, a much larger fern-flora might reasonably be expected. For heat combined with moisture forms the combination which the fern family finds best suited to its requirements. It is where such conditions exist that "fern paradises" are found. If ferns make their homes where other conditions prevail, there is required, or rather, to speak more correctly, there is developed a modification of form and habit.

The result of actual conditions is the development in the cool fog-belt of a luxuriant growth of *Polystichum munitum* and *Pteris aquilina*, which prevail abundantly from one end of it to the other, and of a very limited number of other species. At the other geographical extreme, the arid south, there is a greater number of species, but the abundance of individuals admits of no comparison with the fecundity of the northern coast. The open pine intervals of the forests support an undergrowth of the same *Pteris* that abounds in the north, but in stature, in the structure of its contracted fronds, its aspect is very unlike the robust and tall coast form. *Pteris aquilina* is the only fern that forms a growth over extended areas in the south. The others grow in the select places to which their specialized structure and habits of life fit them. They seek the shelter of boulders, of shrubs, and of rock crevices, and are thus able to exist under very unfavorable conditions. As there are only special places in which they are able to grow, and these limited in respect of the whole area, there is a comparative scarcity of individuals; in some cases more than a comparative, a positive, scarcity. I have in mind a species (*Cheilanthes fibrillosa*) of which the type collection is the only one known, yet its validity has never been questioned by fern students. Of another (*C. Parishii*) there have been but two scanty collections, made at an interval of 20 years, and both in the same canyon. These two are, at least so far as this slender knowledge indicates, endemics, but there are two other ferns (*Notholaena tenera* and *Cheilanthes Feei*) of wider distribution beyond the limits of the state, one of which is known within it by a single collection, the other by only four or five. The rain belt exhibits nothing of this; its ferns are of wide-spread species, and its most prominent one is of cosmopolitan distribution.

The arid regions are the homes of *Pellaea*, of *Notholaena* and of *Cheilanthes*, all ferns modified by the conditions under which they exist. These modifications are two-fold, and affect the structure of the plant, and its manner of life, and I do not recall a southern California species of these genera which does not exhibit both of these characteristics in some degree. In structure, in addition to histological modification, there are the external adaptations manifested in the small size of the frond and the multiplication of its divisions into contracted pinnae which are often broken up into bead-like tessellations. The fronds are thick, the opposite extreme in fern structure from the filmy ferns, which grow at the opposite extreme of conditions, but with which they are connected by a long series of ferns of intermediate structure, the results of adaptations to all the intermediate conditions. All but one of these ferns have evolved organs which serve to protect them in some degree from too great transpiration, to which they are exposed by the excessive insolation, the arid air and the drying winds of their habitat. *Cheilanthes viscida* has a coating indicated by its specific name; *Notholaena cretacea* and *Gymnogramme triangularis* a powdering of yellow or white grains; *Notholaena Parryi* is densely woolly, and *Notholaena Newberryi* has a close cottony tomentum; *Cheilanthes Fendleri* is clad in scale armor, and *Cheilanthes fibrillosa* has fibers mingled with its scales.

The other adaptation affects the habits of these ferns; their life-histories. Ferns, I take it, are normally evergreens, enjoying an uninterrupted growth, each leaf continuing its active functions for the whole period of its life. In the different regions to which ferns have become acclimated other habits of life have become necessary. In cold climates the low temperature may destroy the aerial parts, or may suspend their functions, so that all the operations of life,—growth and the reproductive processes—must be carried out in the summer months. In our region this is the case with *Pteris*, which is cut down by the first frost. But the ferns we are now considering have an opposite life-problem to solve. They have at all seasons sufficient heat and sunlight, and for half the year an excess. Their greatest need is water. Our arid ferns meet the situation by making their growth in the winter, at which period of the year the rains occur, and by passing the summer in dormancy. But these rains are small in amount at any one time, they are uncertain, and the moisture is liable to be speedily evaporated by drying winds. Their fronds, therefore, unfold at once as soon as moistened by the first shower and resume life at the point where they dropped its functions, perhaps months ago. How long this active life may continue depends wholly upon the meteorological conditions. So long as moisture is attainable there is no cessation; but as soon as it fails active life is suspended. In this condition the fern appears dead; the frond is dry and crumbles in the fingers, the stipe and rhizome are brittle and break up in handling. These resting fronds assume various forms. Many curl up into more or less compact balls, exposing to the air the back of the frond, which is the most heavily protected. A study of the mechanics by which this rolling up is effected would be of interest. Perhaps it has been made, but, if so, I have never happened to read of it. If not, it is well worth making. The same phenomenon is familiar in the Mexican *Selaginellas*, which are sold under the name of "resurrection ferns," but *Notholaena cretacea* would be an excellent subject for investigation, for its fronds roll up into very compact balls. The same intermittent manner of growth is universal among the rock lichens of arid countries, and some of the mosses possess it.

I do not know how often this alternation of active and suspended life may be repeated before a frond exhausts its ability to respond; nor whether the duration of the life of a frond is measured by a definite number of months, or by the number of days of active growth, so that in one good season a frond might complete the cycle of its existence in a single winter, but in a less favorable one might require a longer period. Again, the habit is possessed by species which differ in several respects, and appears to be more fully developed in some than in others, but the degree and nature of these differences are not known. These are subjects worthy of investigation, and information concerning them would add much to our knowledge of fern-life.

I am recalling to your attention the characteristics of the arid Californian ferns, not as peculiar to them, but as examples of the phenomena shown, as you are aware, by ferns of all similar regions; nor is it to ferns alone that the question of life under the condition of too much sunshine and heat, and too little moisture is presented. It confronts the whole desert flora, and every plant must find a solution of the problem under penalty of death. How they severally and variously do it is one of the most interesting studies in plant ecology.

Although I have dwelt at such length on the arid ferns, if I may so call them, it is not to be inferred that there are no others in southern California. They are to me the most interesting, because they differ in so many ways from the ideal fern, and because, since this region has an unfortunate deficiency of precipitation and excess of heat, it is the arid ferns which most abound in it. But as there are places in which there is a sufficiency, or an abundance of moisture, and some shelter from the sun's too-powerful rays, there are a number of semi-arid and of moisture-loving species.

By a semi-arid fern I mean one that has some of the physical or habital characteristics of the arid species, or has developed independent methods of meeting the same necessity, namely, of retaining life through the heat and drought of summer. Such a fern is *Cheilanthes Californica.* This has the small and exceedingly divided frond of an arid fern, but it is entirely without any protective indument. It grows at the foot of cliffs, where it obtains shelter from sun and wind, and where it is reasonably sure of a supply of moisture for a considerable period. When that fails it remains dormant until the next winter. *Adiantum emarginatum* is without protection to its fronds, which have broader and less divided pinnae, consequently it also seeks the protection of cliffs, or other shelter, and reliable water for its roots, and when at length moisture dries up the fronds wither and die, and only the root remains alive. I am inclined to put *Polypodium Californicum* also in this class, although its only claim to inclusion is the fact of its summer dormancy. Its rhizomes creep along the crevices of shady cliffs in canyons. It starts into growth very early in the winter, unless the season is unusually dry and late, and in the most favorable places it is able to put in a long working period, but sooner or later the rocks become dry, and its foliage withers and dies. Apparently it needs a summer rest, for it does not grow where there is permanent moisture, although such places are available. There is another form of this species, seldom seen, which grows on open grassy banks. There the effect of the exposure is seen in the thick texture of its much smaller fronds, but its habit is like that of the common thin-textured form of the rock crevices, winter growth and summer dormancy.

A third class of the southern California ferns includes those with perennial foliage and a continuous period of growth. Of necessity they are confined to situations which afford them a reliable supply of water throughout the entire year, and where the extremes of seasonal variations do not, at any period, entirely prevent growth. These conditions may vary within certain limits, so that the activity of life may be accelerated or diminished at certain periods for some of these ferns; and in this respect these vary among themselves, but they must at no time prevent the verdancy of the foliage, or suspend the activity of the vital functions.

Two ferns which are at the outer limits of this class are *Nephrodium rigidum argutum* and *Polystichum munitum.* These ferns, which are found throughout the whole length of the state, and northward to British Columbia, and even one of them, to Alaska, in the southern part of the state grow on lightly shaded canyon slopes, and have a range of altitude which does not expose them either to the intense heat of the lower hills, or to the great cold of the higher mountains. Their water supply is greatest in late spring and early summer, and it is at this period that they make their most vigorous growth; in the late summer their growth is checked by the diminished moisture in the soil, and in winter by the lower temperature. They, therefore, at least for a part of the annual cycle, require a degree of economy in the conservation of their water content. This results in fronds intermediate in form and texture between those of ferns which must live on the scantiest allowance of water, and those which have it in abundance.

Adiantum capillus-veneris illustrates the other extreme in this class. It affects the face of well-shaded cliffs, over which drips water from a perennial source, and being more sensitive to cold, it is limited to a much narrower altitudinal range than the two species last mentioned, and in more exposed positions its fronds are killed in unusually cold winters; otherwise it retains continuous verdancy and maintains continual growth. The thin pinnae reflect the moist conditions under which it grows.

Our last class of ferns are those which grow during the summer, and in winter lose their fronds and retain vitality only in their roots. The most abundant of these ferns are *Adiantum pedatum, Cystopteris fragilis* and *Athyrium filix-foemina.* It will be noticed that these are species which are common over a large part of the country, and with us they occur in that part of our territory which differs little in physical character from their habitats elsewhere. The precise stations which they inhabit here are probably more restricted than in regions where the rainful is more abundant and better distributed. Here, their requirement of abundant and unfailing moisture at their roots, confines them very closely to the margins of streams and springs, and to bogs.

I have, in this imperfect outline, endeavoured to place before you a general idea of the southern California fern-flora, and to indicate the effects of external factors in determining the distribution, the habits of life, and the structural forms of the various members which constitute it. The ferns are not an exceptional family of plants, nor is California an exceptional region, in respect to the conditions which determine plant life. These laws are universal in their application to all vegetation, and to all parts of the world. The study of the results of their decisions upon the life of the plant-kingdom where they rule the court of last resort, is a study fruitful and interesting, and there is no place where it cannot be prosecuted.

SAN BERNARDINO, CAL.

A preliminary List of the Ferns of Rolla, Missouri

F. C. GREENE

Rolla is situated near the center of the Missouri portion of the Ozark region. The surrounding district is rather rough and is consequently well drained, marshy land being almost unknown. The divides are capped by the Jefferson City formation, consisting of cotton rock above and pitted dolomite below. Underlying this is the Roubidoux sandstone which forms low cliffs along the streams. The lowest formation is the Gasconade with its cliff-forming dolomite. Near the Gasconade River this formation produces some fairly high and steep bluffs.

The ferns found, as may be judged from the above statements, are chiefly rock-loving species. Further search will doubtless reveal some lowland species and the dry Gasconade cliffs should add several to the list.

The most interesting find to date is *Ophioglossum Engelmanni.* On June 20, the writer found, in a hollow one mile west of Rolla, several thousand plants of this species, many of which were in fruit; on some plants the spikes had turned brown and on others had not yet attained the length of the leaf. Fertile plants three or four to eight inches long were found. The pitted dolomite mentioned above here forms a low cliff, back of which, away from the branch, is a small bench carved from the cotton rock. On this bench, for about one mile down the hollow—the distance examined—the adder's tongue was very abundant among the rocks, growing in a dry, sterile soil. A few plants were found in the narrow bottom near the stream where the rock ledge dips below the water.

Onoclea sensibilis. One colony of this species was found growing on sandstone in the bed of a creek.

Botrychium virginianum is common in deep shaded ravines and along wooded stream courses.

One small patch of *Polypodium vulgare* was found at King's sink, southwest of Rolla. So far, it has proven the rarest species of the region.

Adiantum pedatum is widely distributed along the base of wooded slopes.

Pteridium aquilinum has been found both on dry and somewhat moist hillsides.

Cheilanthes Féei is abundant on the dry cliffs of the Gasconade dolomite along the Gasconade River. It has also been found on the pitted dolomite near Rolla, but is seemingly rare.

Pellaea atropurpurea occurs on rock ledges throughout the district.

Pellaea glabella is common on dolomite, and especially so along the north bluffs of Little Piney Creek. It grows with *Pellaea atropurpurea,* but can be distinguished at a glance by its lighter green color and the shape of the pinnae.

Asplenium platyneuron is common on outcrops of sandstone and is not at all rare on other rocks.

Asplenium trichomanes appears to be rather rare and has been found only on sandstone.

Camptosorus rhizophyllus is found on wet rocks at the base of cliffs and along streams.

Dryopteris marginalis seems to be confined in this region to outcrops of sandstone, though future observation may prove this wrong.

Polystichum acrostichoides, chiefly the incised form, is abundant in the same situation as the maidenhair.

Filix bulbifera grows luxuriantly on wet cliffs about four and a half miles west of Rolla and will probably be found at other places.

Filix fragilis, like the cliff brake, occurs on rock ledges throughout the region, though in crevices and beneath projecting layers where it is shaded.

Woodsia obtusa is common on shaded cliffs of both sandstone and dolomite.

Equisetum hyemale, possibly a variety, occurs on the Frisco Railroad near Arlington, a few miles west of Rolla. (*E. laevigatum* of Bush).

The writer will be glad to furnish specimens of *Ophioglossum Engelmanni* and *Pellaea glabella* upon receipt of postage.

ROLLA, MISSOURI.

Pellaea Rafaelensis, Sp. Nov.

GEORGE L. MOXLEY

Some seven or eight years ago, when I had just begun to study the ferns, I found in Eagle Rock Canyon, near Los Angeles, Cal., a fern so different from the ordinary "Coffee fern" as to attract my interested attention. I referred it tentatively to *P. flexuosa* (Kaulf.) Link, which I found credited to California. In moving, sometime or other, I lost the specimen and had no opportunity to study it further. I have since seen Mr. S. B. Parish's statement in the Fern Bulletin, xii: 9, 1904, that the reference of *P. flexuosa* to California is "almost certainly erroneous."

Last year in another canyon in the same range of hills I found another plant that very much resembles the one I found before, as I now remember it. I have also recently seen what purported to be a specimen of *P. flexuosa* and my plant is most certainly not that species. Neither does it agree with our common *P. andromedaefolia* (Kaulf.) Fée. I wish to publish it as

Pellaea Rafaelensis, sp. nov. Rootstock slender, short-creeping, covered with narrow brown scales; stipes tufted, pale, glabrous, 30–40 cm. long; fronds 20–30 cm. long, 9–12 cm. broad, lanceolate, mostly bipinnate;

ultimate pinnules 5–15 mm. long, ovate-oblong; texture subcoriaceous; veins evident, numerous, once or twice forked.

Scholl's Canyon, San Rafael Hills, Los Angeles Co., Cal., May 30, 1914. *Geo. L. Moxley*, No. 214.

Known only from the type specimen in my herbarium.

This species differs from *P. andromedaefolia* in its long, narrow frond and more herbaceous pinnules. Indeed in this latter respect it seems to more nearly approach section *Cheiloplecton* than *Allosorus*. The ultimate pinnules do not seem inclined to be revolute and the indusium is rather narrower than in *P. andromedaefolia*, which is, however, probably its nearest ally.

LOS ANGELES, CALIFORNIA.

Fern Trips in Virginia

MARY LOUISE TUTTLE

During the summer of 1914, we made several trips to Virginia in search of ferns. The results of these trips were so satisfactory that it seems quite possible that they would be of interest to the members of the Society.

The first trip was to Rock Enon Springs, Frederick County, Va. This is reached by train to Winchester, and thence by coach or automobile some seventeen miles west to the Great North Mountain. The following ferns were collected during our stay:

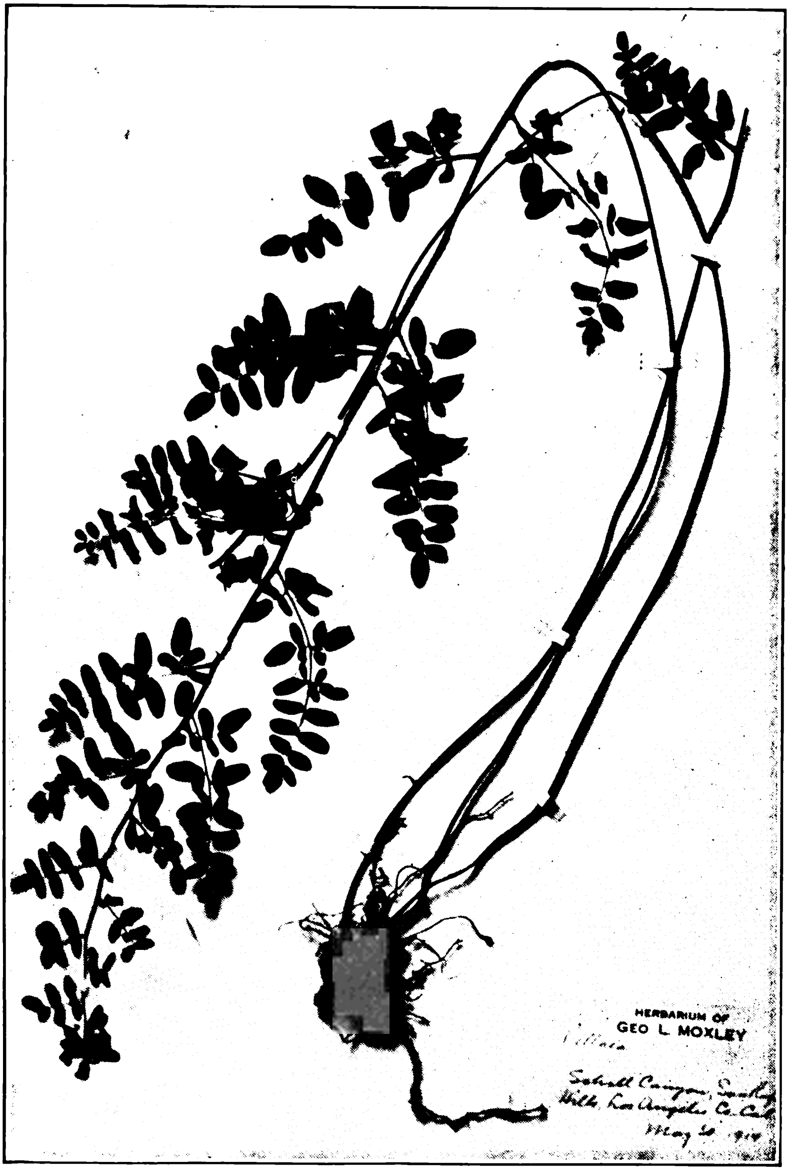
POLYPODIUM VULGARE. Common.

PHEGOPTERIS HEXAGONOPTERA. Common.

ADIANTUM PEDATUM. Common.

PTERIS AQUILINA. Common.

CHEILANTHES LANOSA (*C. vestita*). There is a good sized station located halfway between Gore and Rock Enon, on the west side of the road. Several plants had fronds at least twelve inches long.



PELLAEA RAFAELENSIS MOXLEY

PELLAEA ATROPURPUREA. This fern was found in two places only, about three miles apart, and in each locality there were only a few plants, and these were dwarfed and in poor condition.

ASPLENIUM TRICHOMANES. Common.

ASPLENIUM PLATYNEURON. Common.

ASPLENIUM BRADLEYI. Near the top of one of the smaller ridges, a colony of some seven or eight plants was found. They were facing the east, and in a rather exposed position. In spite of their small size, they seemed to be thriving very well indeed.

ASPLENIUM MONTANUM. It would be difficult to persuade a resident of Rock Enon that this is one of our rarer ferns. For miles along the Catamount ridge, it is to be found on almost every boulder, in almost every crevice. There are positively hundreds of plants. Many fronds seven inches in length were observed. Numerous plants had upwards of twenty-five fronds on them. Perhaps the most interesting plants were observed on the summit of Pinnacle, the highest point in the vicinity, 2800 feet above sea level. There were only a few plants, so stunted by exposure that one could scarcely believe them to be identical with the luxuriant plants to be found in the valley. This one fern would in itself justify the trip; in fact, our main reason for going to Rock Enon was to see it, for Dr. Waters had told us that it was abundant in this place.

ASPLENIUM THELYPTEROIDES (*A. acrostichoides*). Common.

ASPLENIUM FILIX-FOEMINA. Common.

POLYSTICHUM ACROSTICHOIDES. Common.

DRYOPTERIS THELYPTERIS. Not common.

DRYOPTERIS NOVEBORACENSIS. Common.

DRYOPTERIS MARGINALIS. Common.

DRYOPTERIS SPINULOSA. Fairly common.

DRYOPTERIS SPINULOSA, var. DILATATA. Only one plant was seen, and this during our last excursion, and in a locality which we had not previously explored. It is probable that further search would have discovered additional plants.

DRYOPTERIS INTERMEDIA. Fairly common.

FILIX FRAGILIS. Rare in this locality.

WOODSIA OBTUSA. One station only, of some twenty or thirty plants.

DICKSONIA PUNCTILOBULA. Fairly common.

ONOCLEA SENSIBILIS. Common.

OSMUNDA REGALIS. Common.

OSMUNDA CLAYTONIANA. Common.

OSMUNDA CINNAMOMEA. Common.

BOTRYCHIUM TERNATUM. Common.

BOTRYCHIUM VIRGINIANUM. Common.

FERNS AT NATURAL BRIDGE, VA.

PHEGOPTERIS HEXAGONOPTERA. Not very common.

ADIANTUM PEDATUM. Common.

CHEILANTHES LANOSA (*C. vestita*). Near the N. and W. station.

PELLAEA ATROPURPUREA. Very common, one frond in our collection measuring seventeen inches. This fern was noted for the size and complexity of its fronds.

ASPLENIUM EBENOIDES. One locality.

ASPLENIUM TRICHOMANES. Very common.

ASPLENIUM PARVULUM (*A. resiliens*). Very abundant.

ASPLENIUM PLATYNEURON. Common.

ASPLENIUM BRADLEYI. Two plants only. These, however, were growing in a protected place, and were much larger than the plants previously seen at Rock Enon.

ASPLENIUM MONTANUM. About a dozen plants, growing on a ledge of sandstone rock a mile or two to the west of the Bridge.

ASPLENIUM RUTA-MURARIA. Very abundant on the limestone rocks.

ASPLENIUM ANGUSTIFOLIUM. One good sized clump was observed.

ASPLENIUM FILIX-FOEMINA. Less abundant in this locality than one might expect.

CAMPTOSORUS RHIZOPHYLLUS. Carpets the ground and rocks in every direction.

POLYSTICHUM ACROSTICHOIDES. Common.

DRYOPTERIS MARGINALIS. Common.

FILIX BULBIFERA. In great profusion.

FILIX FRAGILIS. Not nearly as common as *F. bulbifera.*

WOODSIA OBTUSA. Fairly common.

BOTRYCHIUM TERNATUM. Common.

BOTRYCHIUM TERNATUM, var. DISSECTUM. Common.

BOTRYCHIUM VIRGINIANUM. Common.

Specimens of *A. Bradleyi, A. montanum, A. Ruta-muraria, A. resiliens, A. ebenoides,* and *Dryopteris spinulosa,* var. *dilatata,* were submitted to Dr. Campbell E. Waters, for his confirmation of our identification, in order that there might be no question as to the correctness of our list.

The foregoing is practically nothing more than a sort of check list of the ferns to be found in these two localities. However, these places are not very far apart, are located in the same range of mountains, and presumably have the same climate. It is, therefore, of more than passing interest to note that ferns which are common in one place are either missing in the other or, if found at all, in exceedingly small quantities. Since the climate is essentially the same, it is obviously a matter of soil which causes these differences, and a brief discussion of this phase of the situation may prove of value.

The Natural Bridge consists of dolomitic limestone, the limestone formation extending for some distance around the Bridge. About a mile or more to the West, there is a small outcrop of sandstone. At Rock Enon, there are two main formations, one a very hard white sandstone, and the other a soft shale. I am informed by surveyors of the U. S. Geological Survey that only one outcrop of limestone occurs in the immediate vicinity of Rock Enon, and that is in a dry, open field, and contains no ferns whatever.

At Natural Bridge, *Filix bulbifera, Pellaea atropurpurea, Asplenium angustifolium, A. Ruta-muraria, Camptosorus rhizophyllus* were found in the greatest abundance, while the shield ferns were represented by only one species, *Dryopteris marginalis. Asplenium montanum* was represented by a single colony which was located on the sandstone ridge. At Rock Enon, *Filix bulbifera, Camptosorus rhizophyllus, Asplenium Ruta-muraria,* and *Asplenium angustifolium* were absent entirely, and only a few plants of *Pellaea atropurpurea* were found. On the other hand, *Asplenium montanum* occurred in abundance, the shield ferns were well represented, and a fair sized colony of *Asplenium Bradleyi* was found. *Cheilanthes lanosa* grew only on the shale formation. It is apparent, therefore, that *A. angustifolium, A. Ruta-muraria, F. bulbifera, C. rhizophyllus,* and *P. atropurpurea* prefer a basic soil, such as is found at Natural Bridge, whereas *A. montanum* and *C. lanosa* prefer the acid soil of Rock Enon. This is further borne out, at least as far as *P. atropurpurea* is concerned, by the fact that we have noted perhaps half a dozen localities around Washington and Baltimore, where *P. atropurpurea* was found growing in the mortar on old walls. Members of the Society will remember the profusion of *A. angustifolium, F. bulbifera,* and *C. rhizophyllus* growing on the limestone formation at Jamesville, New York. These preferences of various ferns for certain kinds of soil are, of course, not at all new, but the present instance serves to emphasize the point in question.

By far the most interesting fern in the two localities is *A. montanum*, although the finding of either *A. Bradleyi* or *A. ebenoides* would in itself be a pleasure without alloy. The western spur of the Great North Mountain is called the Catamount Ridge, and takes the form of a tall narrow ridge about five miles or so in length, and having at times sides which are perpendicular for fifty feet or more. All along this ridge, *A. montanum* can be found. It is practically impossible for this station to be wiped out of existence by any of the common causes for such disasters. In the first place, the huge bare rocks preclude the idea of a forest fire destroying the plants, the stone itself is of little value, even for building purposes, while to gather more than a small proportion of the plants would require the agility of a circus acrobat and at least a fifty foot ladder. In view of the comparative rarity of this fern, and its gradual disappearance from some of its former haunts, it is a great pleasure to be able to record the existence of such a wonderful station which bids fair to be with us for many years to come.

WASHINGTON, D. C.

Notes and news

MORE ABOUT THE HABITAT OF OPHIOGLOSSUM

While the subject of the habitat of *Ophioglossum vulgatum* is still warm a few notes from southwestern Vermont may not be amiss. In this connection it is interesting to learn what Clute in "Our Ferns in Their Haunts" says of it.

"Doubtless the most promising place to look for it is among the grasses and sedges in moist meadows, but upon this point there is considerable difference of opinion. Some years ago, in the *Fern Bulletin*, several writers gave their experiences in collecting it. One wrote that in northern New York he found it in 'dry pastures, on and about hummocks of hemlock loam,' and added 'it is seldom found in moist places.' Another in Vermont says, 'in old meadows, they will grow in little hollows where it is richer and more moist,' while still another in Kentucky found it common 'in dry open woods,' and the writer that 'it may safely be looked for in red cedar groves,' adding, 'I know few such places where it does not grow.' In contrast to these, Mr. A. A. Eaton has found fine large plants in seven inches of sphagnum moss in New Hampshire swamps."

In Gray's "New Manual" the habitat is given as: "Meadows and pastures, rarely on dry slopes," which is much the same as that quoted from D. C. Eaton on page 43 of the current volume of the JOURNAL.

My own experience goes to show that, like Mr. Jenks, "unnoticed" is a better term to use in describing the frequency of its occurrence than "uncommon"; still it may well be that, like so many other plants, it is common in some sections and rare in others without any apparent reason. Whenever I have been to the summer meetings of the Vermont Botanical Club there are always some people present to whom it is rare.

I have specimens from the Anaquassacook meadows near Shushan, N. Y., as mentioned by Mr. Burnham on page 47 of the JOURNAL, where it was shown to me as being something rare. I also found it in a cedar swamp near Fair Haven, Vt., when with the Vermont Botanical Club last summer. In West River Valley I find it in bogs, moist pastures, and today (May 29) on a "dry slope" with a southeastern exposure and without shade of any kind. My specimens from Shushan, N. Y., are somewhat taller and more slender than those from a "moist pasture," but this may well be in part from the competition for light in the wetter meadow which is less keen in dry places.

LESTON A. WHEELER.

TOWNSHEND, VERMONT.

I find *Ophioglossum* everywhere except in sphagnum. I found them in Salisbury, Conn., in an old cart-path on the mountains. Here they grow in every pasture, right out in the open, along with *Antennaria* and hawkweed. I have found them in clear sand along a railroad, and in dry, open ground at an elevation of over 1400 feet. I mention this last because I was told by a fern student that there was a tradition that *Ophioglossum* had never been found above 600 feet. I fancy that here they may be found in any place where there is clay soil or subsoil to hold the water.

MRS. ORRA PARKER PHELPS.

CANTON, N. Y.

Mr. R. A. Ware contributes the following list of habitats for *Ophioglossum* as recorded on the sheets in his herbarium: Georgeville, Quebec, cedar swamp; Pleasant Ridge, Somerset Co, Maine, "with *Liparis Loeselii* in slight depression in open, upland grass field"; Dover, Maine, meadows; Hinsdale, N. H., sphagnum swamp; Alton, N. H., wet meadow; Westmore, Vt., "upland, open grass field, with young plants of *Onoclea sensibilis* after mowing"; Harvard, Mass., in sphagnum; Plainville, Conn., moist rocky woods; Cornwall, Conn., dry, wooded hillside; Mansfield, Conn., open bog; Lima, Delaware Co., Pa., swamp. Also specimens labeled *O. arenarium* from "Longport, N. J., sea beach."

DOES OPHIOGLOSSUM VULGATUM REQUIRE TEN YEARS FROM SPORE TO FIRST GREEN LEAF?

In addition to the points mentioned in a recent number, Prof. Campbell has brought out in his monograph of the Eusporangiatæ many other very interesting points regarding *Ophioglossum* and *Botrychium*. Two of these which are of special interest relate to *O. vulgatum* and *B. Lunaria*.

When a spore of *O. vulgatum* germinates it appears probable from the work of Bruchman as reported by Campbell that the first green leaf is ten years in getting above ground. This first green leaf is really the second leaf of the plant and is always sterile. The third leaf may be fertile but is not always so.

A similarly long time is required by *B. Lunaria* to produce its first fertile leaf if Bruchman's conclusions regarding this species are correct. He reports that there are first produced seven to nine scale leaves at the rate of one a year. Following these come the green and fertile leaves. In *B. virginianum*, however, the first leaf produced is believed to extend above ground, although it is not fertile. The time required is not stated.

Two points of interest attach to these facts. First, imagine planting spores or seeds and then having to wait ten years to have the crop appear above ground! Second, it is probable that the long developmental period required explains some of the peculiarities in distribution of various species of these two genera. It is a common experience to search very thoroughly some likely place for *Ophioglossum* without finding a single plant. One may even have difficulty in finding the species in the same station two years in succession.

If it requires ten years for *O. vulgatum* to develop its first green leaf from the spore stage one can understand why a field which had been ploughed nine years previously would show no plants of this species, even though conditions were in all other respects favorable. If we go a little farther with hypothesis and suppose that the next year ten fruiting plants were found and all collected we should then have to wait ten years more for another crop, assuming that some spores had dropped in connection with the collection.

I hereby invite all those who contributed to the very satisfactory answer to my earlier question as to the habitat of *Ophioglossum* to turn their attention to a new enquiry along the same lines. Does *O. vulgatum* require ten years to produce its first green leaf? The method of answer will be easy. Visit any station you may know, as many as possible, and find out from the owners of the land, or otherwise, whether it has been cultivated within ten years. It is practically certain that ploughing, etc., would destroy all rooted plants and require a sowing of spores for the production of more plants. If any one finds a station which has certainly been under cultivation within ten years it will serve to amend the conclusions of Bruchman noted above.

R. C. BENEDICT.

Of interest, especially in connection with the field meeting of the Society in Onondaga County, New York, is the publication by a member of the Society, Mrs. L. Leonora Goodrich, of a Flora of Onondaga County as collected by the Syracuse Botanical Club of which Mrs. Goodrich has been president for many years. The list includes fifty-two different kinds of ferns and allies, eleven lycopods, and seven equisets. To this may certainly be added three hybrids in *Dryopteris* and possibly also *D. simulata* which is known to occur just over the border in Oneida County. Seventy species of pteridophytes makes a very good list for one county of about forty miles square. It may well be added that the Syracuse Botanical Club with its one honorary male member, Rev. Dr. Beauchamp, has done a great deal in making the flora of Onondaga County known.

R. C. B.

A REVIEW: W. R. MAXON. REPORT UPON A COLLECTION OF FERNS FROM WESTERN SOUTH AMERICA[1]

The ferns referred to in the report here considered were collected in Peru, Chile, and Bolivia, by Dr. and Mrs. J. N. Rose in the latter part of 1914. The special object of the trip was the collection of cacti. Of the twenty-five species listed by Mr. Maxon, twenty-two are ferns and three so-called "fern allies," i. e., equisets and lycopods. Five of the ferns are found to be new species, as follows: *Polypodium*, two, *Cheilanthes*, two, and *Notholaena*, one.

This large proportion of new species is of special interest as an emphasis of the fact that the Andean chain, both in South America and in North America, is probably the most extensive terra incognita of ferns now left to be explored. Every collection from these regions includes numerous new species. Dr. Rose's expedition for cacti naturally took him into regions poor in ferns, but even these yielded over twenty per cent. new species. In the regions of greater rainfall, the moist forested slopes toward the west, not only are there many more species, hundreds indeed, but there are also at least as large a proportion of undescribed forms.

R. C. B.

American Fern Society

THE SYRACUSE MEETING

A field meeting of the Society was held, as announced, July 13–16, with headquarters at Syracuse, and with a total attendance of about forty. Nine new members were enrolled during the meeting.

The visiting members were very hospitably received. Mr. and Mrs. William Spalding entertained them most pleasantly at an informal reception, a unique feature of which was the presentation to each guest of a living plant of the hart's-tongue—a cultivated plant, be it known, raised from spores by a florist. The Syracuse Botanical Society provided a picnic luncheon of almost dangerous proportions and attractiveness on the last day of the meeting. On this day, also, what remained of Mrs. Spalding's supply of hart's-tongue plants were set out in favorable places on the State Reservation, in the hope of establishing new stations for this rare fern.

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[1] Smithson. Misc. Coll. 65: no. 8. 1–12. 3 May 1915.

All three days were spent in exploring the region about East and West Green Lakes and White Lake, already described in the announcements of the meeting. This area, small though it is, proved well worth the time spent on it, both for its unusual geological features, and for the richness of its fern flora in number of species and in their intrinsic interest and peculiarities of distribution. A list of the species found follows:

Polypodium vulgare, Phegopteris Dryopteris, Adiantum pedatum, Pteridium aquilinum, Pellaea atropurpurea, Cryptogramma Stelleri, Asplenium Trichomanes, A. platyneuron, A. angustifolium, A. acrostichoides, A. Filix-femina, Scolopendrium vulgare, Camptosorus rhizophyllus, Polystichum acrostichoides, Dryopteris Thelypteris, D. noveboracensis, D. marginalis, D. Goldiana, D. cristata, D. Clintoniana, D. spinulosa, D. intermedia, Cystopteris bulbifera, C. fragilis, Dennstaedtia punctilobula, Onoclea sensibilis, O. Struthiopteris, Osmunda cinnamomea, O. Claytoniana, O. regalis, Ophioglossum vulgatum, Botrychium simplex, B. ramosum, B. obliquum, B. dissectum, B. ternatum, var. intermedium, B. onondagense, B. virginianum, Lycopodium lucidulum, L. annotinum, L. complanatum, var. flabelliforme, and two hybrids, *Dryopteris Goldiana* × *marginalis* and *D. intermedia* × *marginalis.* A nearly complete set of specimens will be deposited in the Society herbarium.

The Society owes much of the success of the meeting to the hearty interest and co-operation of the local naturalists, members and otherwise. In recognition of this, resolutions were passed, formally thanking Mr. and Mrs. Spalding and the Syracuse Botanical Society for their hospitality; the guides, Mr. Ransier and Dr. Todd, whose accurate knowledge of the Green Lakes region enabled the visitors to see its many points of interest in the most satisfactory way; and the Syracuse newspapers for their full reports of the work done.

The following resolution in regard to the proposed extension of the State Reservation to include all the Green Lakes area was also passed:

Whereas, The region about East and West Green Lakes in Jamesville possesses, in its geological and botanical aspects, a character of unusual interest, including as it does within a limited area an exceptional variety of ferns and other plants, and

Whereas, The acquirement of such areas, where possible, contributes to the health and enjoyment of an increasing number of persons of the present and future generations, and

Whereas, It seems particularly desirable that this area should be acquired before it is in any way despoiled or disfigured through mercantile interests,

Resolved, That in the opinion of the visiting members of the American Fern Society this region is one which should be set aside as a permanent public reservation in its present natural and wild state.

The following communications from different members present may serve to bring out points of special interest and to indicate some of the uses of such meetings.

The thing that impresses me is the fact that there are all over the country people who are interested and would be glad to join the Society if they only knew about it and its work. Our problem is to get the members we have to tell others.

C. H. BISSELL.

Notwithstanding the fact that the Jamesville region was familiar country to me as I had tramped it from boyhood till through college, I was greatly impressed with the large number of species of ferns which we were able to discover in the three days of our Society meeting in July. Of the forty different kinds found I had in my earlier tramps seen all but perhaps three or four kinds, but it was somewhat surprising to have even that number added to your list for your home region. When it is realized that two or three more species are known to occur in the neighborhood and should be added to the list the great richness of the two or three square miles is apparent. Remember, too, that this list includes no lycopods or equisets, although it does contain two or three hybrids.

Interest is added in this connection to the project which had been agitated for some time in Syracuse, a few miles away, to make the region around East Green Lake a State reservation, not only on account of its fern riches, but because of its generally interesting flora, its great geological distinctiveness, and its natural beauty. In the Society excursions both East and West Green Lakes were visited. As has already been noted in the JOURNAL the region immediately adjacent to the west lake has already been set aside as a State preserve. But the west lake contains nothing in the fern line not found near the east lake and furthermore lacks a considerable number of species which occur about the east lake. Mention made above of finding forty kinds of ferns in two or three square miles, had in mind a strip of land including the west lake but this would be unnecessary. A triangle with the longest side not more than a mile including the east Green Lake and extending to the shores of White and Evergreen Lakes to the east would contain practically all the forty kinds of ferns found.

One of the local newspapers, the Syracuse Post-Standard, suggested that the Fern Society in its field meetings might well determine from the botanical standpoint what the area of the proposed new park should be. As it happens the area the botanist would preserve is practically co-extensive with that which would be desirable from the geological and scenic view-points and includes East Green, White, and Evergreen Lakes, the swamps surrounding them, with the cliffs and woodlands which lie to the west and south.

R. C. BENEDICT.

While visiting the Green Lake region of New York State last July I was interested in noting the apparent effect of the extraordinary ecological conditions upon the relative abundance of the common pteridophytes. To one accustomed to the fields and woods of the average locality in northeastern North America, where the various soil elements have been pretty well mixed together by glacial activity, this region of rock almost exclusively calcitic seems to exhibit a fern distribution somewhat strange and unbalanced.

The almost total absence of Equisetums is not surprising when we consider the prominence of silex in the Equisetum anatomy, but the similar absence of Lycopodiums is not so easily explained. In several places the steep talus slopes drop down into sink holes where the air feels distinctly chilly, an indication, possibly, of ice deposits in adjacent caverns, or rock crevices. In one of these "refrigerators," as they were dubbed by some of our party, I found a thick growth of *Lycopodium annotinum* covering an area of several square rods—the only occurrence of this plant that came to my notice during the trip. Perhaps the continuous low temperature served to retard the growth of lime loving plants that otherwise might have been competitors too strong for the *Lycopodium*.

Polypodium vulgare was seen but twice—in one case growing on tree roots and in both stunted. *Dicksonia* was very uncommon, and in order to add *Dryopteris noveboracensis* to our list it was necessary to make a side trip of a mile or more to the very outskirts of the Green Lake country. In the open woods and clearings where these species were to be looked for *Cystopteris bulbifera* held undisputed sway.

Of the three Athyriums *A. filix-femina* was least abundant. But as has been recorded of many other localities, so here *A. angustifolium* was always found associated with *Dryopteris goldiana*.

E. J. WINSLOW.

THE CALIFORNIA MEETING—A meeting of the American Fern Society was held at 2 P. M., August 2, in the Herbarium of the University of California. The meeting was announced in the A. A. A. S. program, so, although but few members of the Society were present, a number of botanists attended, making twenty in all. An excellent paper on Southern California Ferns was presented by the well-known California botanist, Mr. S. B. Parish of San Bernardino. An interesting discussion of the paper followed, participated in by Prof. F. E. Clements of Minnesota, Prof. E. B. Copeland of the Philippine Islands, Dr. R. M. Harper of the Florida State Geological Survey, and others. We were very sorry not to have some of the eastern members with us. If any members visit California later we shall be glad to be of service to them in any way we are able.

CARLOTTA C. HALL.

The fern garden of the Society, suggested in the last issue of the JOURNAL, was actually begun at the Brooklyn Botanic Garden in July with two plants collected at the central New York field meeting. The plants sent were *Dryopteris Goldiana* and *D. intermedia* × *marginalis*. These and others received later were placed in rotted leaf mould under trees to await the construction of a specially designed bed.

Further shipments were received of plants from the Adirondacks and from Vermont and others are expected or may already have arrived. Members are urged to send in not only rarities but common species, and without fear as to duplication, as plants of the same species from different localities are always interesting. Where possible large sods or large single specimens should be sent. Transplanting will be safe even up to frost time if considerable soil is included and the roots well packed. A list of species received will be published later.

When the plan for a Society fern garden became known, the excellent suggestion was made that such a garden would be accessible to many more people and so of greater usefulness, if it could be put into the plural—that is, if collections of living plants were maintained, not only at Brooklyn, but in different parts of the country. Some effort has been made in this direction. The Botanic Garden of Harvard University, Cambridge, Mass., has agreed to receive and cultivate plants sent in, on the same terms as the Brooklyn garden; and a beginning has already been made there. It is hoped that similar arrangements may be made with other botanic gardens.

New Members—Dana S. Carpenter, Middletown Springs, Vt.; Miss Una G. Dawson, 97 Mountfort St., Boston, Mass.; W. R. Dunlop, Fayetteville, N. Y.; Edwin T. Emmons, Geneva, N. Y.; Henri Gadeau de

Kerville, Rouen, France; Frederic W. Grigg, P. O. Box 43, Newtonville, Mass.; Miss M. L. Hall, 130 Spring St., Rochester, N. Y.; Mrs. Mary B. Hummel, 3632 Powelton Ave., Philadelphia, Pa.; Prof. F. P. McFarland, 703 South Limestone St., Lexington, Ky.; Thomas H. Mather, 108 Comstock Ave., Syracuse, N. Y.; Dr. George T. Moore, Missouri Botanical Garden, St. Louis, Mo.; Miss Minnie L. Overacker, 109 Robineau Road, Syracuse, N. Y.; Prof. Ida L. Reveley, Wells College, Aurora, N. Y.; Miss Louise W. Roberts, 520 Roberts Ave., Syracuse, N. Y.; Miss Ida H. Stebbins, 52 Albemarle St., Rochester, N. Y.; Rev. J. H. Stolz, 211 Cedar St., Gary, Ind.; Dr. J. B. Todd, 740 South Beech St., Syracuse, N. Y.; Miss Alice W. Wilcox, Fairbanks Museum, St. Johnsbury, Vt. Changes of Address—Walter H. Aiken, 1520 Aster Place, Cincinnati, O.; Dr. Ruth Marshall, Northern Illinois State Normal School, De Kalb, Ill.; Rev. George L. Moxley, 626 W. Ave. 54, Los Angeles, Cal.; Charles O. Rhodes, Lock Box 366, Groton, N. Y.

The annual election resulted in the re-election of the present officers and in very large majorities for all three of the proposals laid before the members. The report of the Judge of Elections will be printed with the annual reports, in the next number of the JOURNAL.

C. A. WEATHERBY, *Secretary.*

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ERRATUM

Page 84, line 26, for *Lygenostoma* read *Lagenostoma*

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American Fern Journal

Vol. 6 JANUARY–MARCH, 1916 No. 1

Some Ferns of Dutchess County, New York

PAUL C. STANDLEY.[1]

The latter part of August and the early half of September, 1915, the writer and Mr. H. C. Bollman spent camping at Clove in southern Dutchess County, New York, upon the farm of Mr. P. H. Christie. Much of the writer's time was given to collecting plants and he found many of interest to him, especially since he had never before had an opportunity to botanize so far north. While the area explored was not very large, a number of rather rare plants were discovered, as well as several which show slight extensions of range, judging from the lately published Flora of the Vicinity of New York. Thirty-six species of ferns and fern allies were observed, surely a large number for any area of the same size in temperate North America, and probably others were overlooked. While none of the species are rare, it seems worth while to publish some record of them, especially since two represent southward extensions of range, according to Miss Slosson's treatment of the group in the work just mentioned.

The settlement of Clove occupies the broad, open valley of one of the heads of Fishkill Creek, which runs southward. Abruptly on the east and west rise two ranges of low mountains. The writer collected chiefly on the East Mountain, as it is called. This, like most

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[1] Published by permission of the Secretary of the Smithsonian Institution.

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similar mountains of the regions, is well wooded, at least on the sides, while its summit is broad and flat, embracing large areas of open meadows, broken by numerous marshes or outcroppings of polished rocks. Many springs issue from the sides of the mountain and, uniting with streamlets from the marshes, fall down over mossy boulders hidden in the shade of chestnuts, oaks, elms, and other deciduous trees. It is along these wooded ravines that ferns are most abundant, but some, like *Dryopteris Thelypteris* and *D. Clintoniana*, prefer the wooded swamps of the valley, where in September great beds of fringed gentians spread a sheet of blue. The royal fern frequents chiefly the dark blueberry swamps which lie high up on the mountains, but it, too, sometimes descends to the valley. These upland swamps, which were brightened by the crimson leaves of the swamp maple and sometimes by the scarlet berries of mountain holly, occupy hollows on the mountain sides, shut in, often, by huge walls of rocks. Above and around them stretch acres of scrub-oak thickets which exactly simulate the oak thickets which occupy the summits of some of the lower mountains in New Mexico, the resemblance being accentuated by the scattered pines which rise here and there.

The following is a list of the ferns and their relatives which were collected or observed, all in the immediate vicinity of Clove. A visit was made one day to the Shawangunk Mountains of Ulster County, where there have been found *Asplenium Bradleyi* and other rare ferns, but during the brief time spent there only some of the very common species were noticed.

1. POLYPODIUM VULGARE L. Common on rocks and in rich shaded soil nearly everywhere.

2. ADIANTUM PEDATUM L. Very abundant, the fronds reaching a large size. Some of the young plants strikingly suggest the fronds of *A. Capillus-Veneris*.

3. PTERIDIUM AQUILINUM (L.) Kuhn. Abundant on hillsides and in open mountain meadows.

4. ASPLENIUM TRICHOMANES L. This was found in but one or two localities and only a few small plants were found each time, growing on moist cliffs in the woods.

5. ASPLENIUM PLATYNEURON (L.) Oakes. The ebony spleenwort, frequently so abundant, is apparently far from common here, being seen in only a few places. It was noticed in one locality upon a stone wall along a lane. Thriving individuals were also observed on the rocks lining an old well.

6. ATHYRIUM THELYPTEROIDES (Michx.) Desv. Very abundant in rich woods, and one of the most common ferns of the region.

7. ATHYRIUM FILIX-FEMINA (L.) Roth. Not very common, apparently, but some atypical, much reduced plants were collected.

8. CAMPTOSORUS RHIZOPHYLLUS (L.) Link. The walking leaf is as local here as elsewhere. A fine colony was observed on some boulders lying among hemlocks on an eastward slope. A few plants were found in another locality on a small mossy boulder lying in a brook.

9. POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. The common form of the Christmas fern is abundant. The writer collected plants, however, which afford an excellent example of entropic homoeosis, as defined by Mr. R. G. Leavitt.[1] In these plants the pinnae have all been variously modified. In some of the fronds they are merely deeply toothed; in others they are pinnately cleft nearly to the midvein, and in some the two basal auricles have developed into pinnules, while the rest of the pinna is toothed. In a few fronds the sterile basal pinnae are truly pinnate, reproducing exactly the form of a normal frond. Even more striking are

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[1] R. G. Leavitt. A vegetation mutant, and the principle of homoeosis in plants. Bot. Gaz. 47: 30-68. 1909.

some of the fertile terminal pinnae, which, also, are pinnate, each pinna thus simulating a normal frond. On one frond there are six terminal pinnae thus metamorphosed. Only one clump of this interesting form of *Polystichum acrostichoides* was found, growing with typical plants.

10. DRYOPTERIS HEXAGONOPTERA (Michx.) C. Chr. Widely dispersed in moist woods. In Gray's New Manual it is stated that in this species the blades are "*usually broader than long,*" while in *D. polypodioides* they are "*longer than broad,*" but the statement for *D. hexagonoptera* does not hold in this locality, where many of the fronds were longer than broad.

11. DRYOPTERIS DRYOPTERIS (L.) Christ. The oak fern was found in some abundance in a damp ravine, growing among moss along with *Lycopodium lucidulum.* In the recent Flora of the Vicinity of New York it is stated that in New York this fern is not known south of the Catskills, consequently the present record is a slight extension of range.

Mr. H. Woynar has pointed out in a letter to Mr. Maxon, and it also is shown in Christensen's Supplement to the Index Filicum,[1] that the binary name *Dryopteris Dryopteris* was published before the appearance of the second edition of Britton and Brown's Illustrated Flora, where it was proposed as new.[2]

12. DRYOPTERIS THELYPTERIS (L.) A. Gray. Common in swamps and marshes.

13. DRYOPTERIS NOVEBORACENSIS (L.) A. Gray. Well distributed, but not very abundant, in rich woods.

14. DRYOPTERIS MARGINALIS (L.) A. Gray. One of the common ferns of this locality. The writer was impressed by the fact that the fronds were much larger

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[1] P. 32.

[2] 1: 23. 1913.

than in the plants of certain Missouri localities at which he has observed the species.

15. DRYOPTERIS CRISTATA (L.) A. Gray. Seen only once, a few plants growing in a swamp under red maples and poison sumac.

16. DRYOPTERIS CLINTONIANA (D. C. Eaton) Dowell. This, also, was found but once, growing with the preceding, but more abundant.

17. DRYOPTERIS INTERMEDIA (Muhl.) A. Gray. Common in damp woods.

18. FILIX BULBIFERA (L.) Underw. Very abundant and well developed, on moist rocks along brooks, the fronds freely bulbiferous.

19. FILIX FRAGILIS (L.) Underw. Much less common than the preceding.

20. WOODSIA OBTUSA (Spreng.) Torr. Occasional on rather exposed rocks.

21. DENNSTAEDTIA PUNCTILOBULA (Michx.) Moore. Very abundant, some of the fronds reaching a large size.

22. ONOCLEA SENSIBILIS L. Common. One colony of the plants was extensively infested by a fungus which Prof. W. G. Farlow has identified as *Uredinopsis mirabilis* (Cke.) P. Magn.

23. PTERETIS NODULOSA (Michx.) Nieuwland.[1] *Onoclea nodulosa* Michx. Fl. Bor. Amer. **2:** 272. 1803, excluding synonyms; *Matteuccia nodulosa* Fernald, Rhodora **10:** 164. 1915; *Matteuccia Struthiopteris* and *Onoclea Struthiopteris* of American authors, not *Osmunda Struthiopteris* L.

In the recently published Flora of the Vicinity of New York the New York range of this species is given as "The region of the Catskills, in Delaware and Greene counties." The writer, however, found it growing abundantly in a wooded swamp near Clove, along with *Dryopteris cristata* and *D. Clintoniana*. He also saw cultivated plants said to have been brought from Dover Plains in the Harlem Valley.

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[1] Amer. Midl Nat. 4: 334. 1916.

Fernald has shown recently[1] that the American ostrich fern is specifically different from that of Europe, and has restored to it its first distinctive name, applied originally by Michaux. Other early writers, like Willdenow, Desvaux, and Lowe, also considered it a valid species, although recent American and European botanists have taken it for granted that the European and American forms were conspecific. In distinguishing the two species Fernald, however, evidently overlooked a recent paper by Nieuwland[2] in which that writer has shown that the proper generic name for the ostrich ferns is *Pteretis* Raf., rather than *Matteuccia* Todaro. The latter name, which has received wide recognition in recent years, was published in 1866, but it is antedated by that of Rafinesque by 48 years. There is no doubt as to the validity of *Pteretis*. Rafinesque publishes it in the second instalment of his caustic review of Pursh's Flora,[3] which appeared in 1818. Upon page 268 of that work we find the following: "137. *Struthiopteris,* Willd. is abominable, should *Pteris* stand, being formed of two coupled names, *Struthio* and *Pteris;* and at all events it is bad, therefore *Pteretis* may be substituted." It thus appears that the type of the genus is *Struthiopteris germanica* Willd. The European species should be known as *Pteretis Struthiopteris* (L.) Nieuwland, and the American one as *P. nodulosa* (Michx.) Nieuwland.

24. OSMUNDA REGALIS L. Abundant in swamps, especially in those high up upon the mountains.

25. OSMUNDA CLAYTONIANA L. Common.

26. OSMUNDA CINNAMOMEA L. More common, perhaps, than the last, and often growing with it. The plants in this locality seem remarkably uniform.

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[1] Rhodora 17: 161-164. 1915.

[2] Amer. Midl. Nat. 3: 194-197. 1914.

[3] Amer. Monthly Mag. 2: 265-269. 1818.

27. **Botrychium obliquum** Muhl. Observed in several localities, usually in open pastures but once in a swamp. Probably the plants were abundant, for when one was noticed careful search always revealed others in the immediate vicinity.

28. **Botrychium dissectum** Spring. Reduced plants referable to this species were collected in an open hillside pasture. In the specimens collected the differences between this and the last preceding seem very slight and hardly specific.

29. **Botrychium virginianum** (L.) Sw. Scattered plants were frequent in the moist woods.

30. **Equisetum arvense** L. Rather common in damp shaded soil of the valley.

31. **Equisetum hyemale robustum** (A. Br.) A. A. Eaton. Observed in several localities about pools of water.

32. **Lycopodium lucidulum** Michx. Rather abundant in deep ravines, at the foot of cliffs.

33. **Lycopodium obscurum** L. Apparently rare, for it was seen in a single locality.

34. **Lycopodium complanatum flabelliforme** Fernald. Very abundant, especially in birch thickets, where it was the most conspicuous herbaceous plant.

35. **Selaginella rupestris** (L.) Spring. This was very abundant in one locality on some wide expanses of worn rocks in a pasture near the summit of a mountain. Growing with it were *Polygonum tenue* and *Sarothra gentianoides*.

36. **Selaginella apoda** (L.) Fernald. Among moss in open marshes, among *Drosera*, *Parnassia*, and other bog plants.

WASHINGTON, D. C.

Some horticultural Fern Variations

R. C. BENEDICT

The variations to be dealt with here exist in the tropical fern genus *Nephrolepis,* of which one or two species occur wild in the United States in Florida. Some of the variations found in this genus have been found as wild forms but the large majority are only known from their occurrence under cultivation in florists' greenhouses. They are none the less of interest to students of wild forms not only because of their intrinsic interest, but because in some cases they show differences similar to those existing between distinct species of wild ferns.

In other words, we have in the variations of *Nephrolepis* an illustration of one possible way in which species may have been differentiated. In about fifteen years more than fifty distinct forms have arisen from one species, *Nephrolepis exaltata.* Of course these fifty new forms are not all separated inter se by what would be considered specific differences. Some of the forms very closely resemble each other, but it is a most interesting fact that in some such cases the very similar kinds have a very diverse origin, a circumstance which probably often finds a parallel among wild forms, and which indeed may explain the anomalous distribution of a fern like *Asplenium platyneuron,* in America and South Africa, not to cite others. It is also safe to say that the well-distinguished varieties among this group of fifty would, if brought in separately from the tropics, be readily accorded specific rank. It may be added, that, paradoxically, the variations of this one species have gone beyond the commonly accepted generic limits of *Nephrolepis.*

The variations to be considered here have all arisen from the one species, *N. exaltata.* Other species of *Nephrolepis* have also given rise to somewhat similar horticultural variations but in small numbers, probably because they are much less widely cultivated than *exaltata*. This species has been cultivated more than fifty years, in increasing amounts as time passed. By 1895 it had become a comparatively well-known house plant with the popular name of "sword fern." About this time florists became aware that they were growing under this name two different ferns, one rigid, rather erect-leaved, with plane pinnae, and spore-fertile, the other more flexible, drooping, with slightly undulated pinnae, and mainly, if not entirely, spore-sterile, reproducing only by runners. These two forms are said to have been referred to the late George E. Davenport of the Fern Society for diagnosis, the second form being named by him *N. exaltata bostoniensis* because of its prevalence and possible origin near Boston.

The old sword fern then practically went out of existence as a trade species, and the Boston fern was grown in ever increasing numbers. Nowadays the few dealers who advertise the sword fern or *N. exaltata* seem always to have it confused with other species, *N. cordifolia* or "*N. tuberosa.*" True *exaltata*, as I consider it, I know only as Porto Rican plants collected for the New York Botanical Garden.

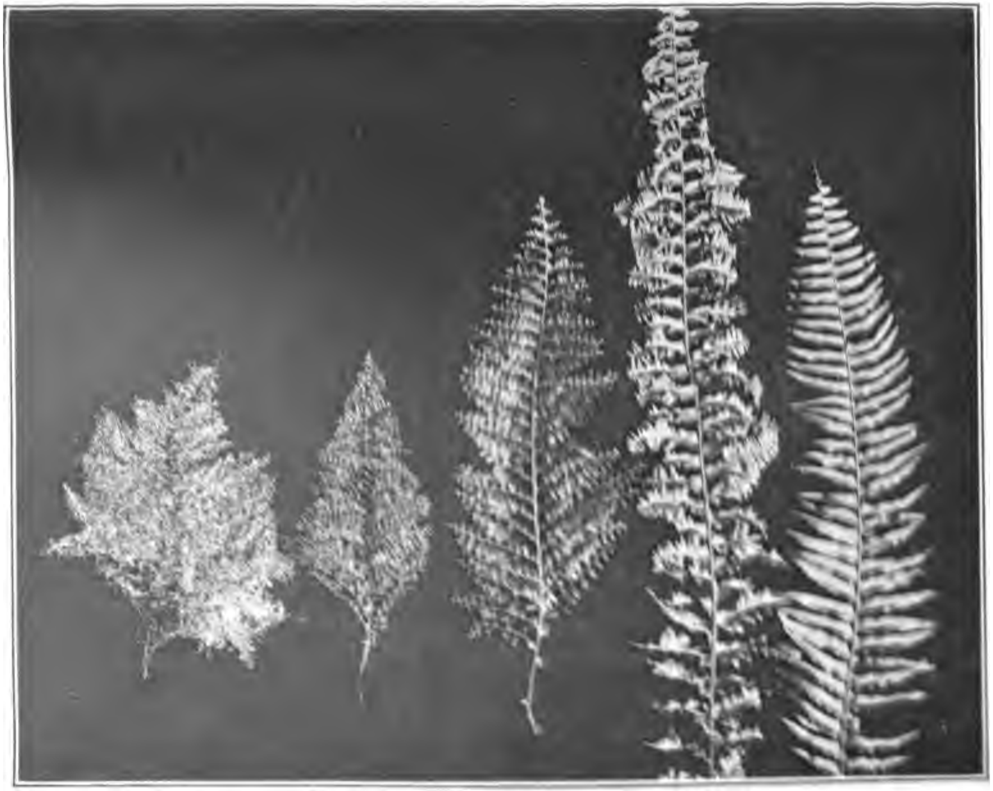
The fifty varieties already referred to have all come from the Boston variety of *N. exaltata*. Beginning about 1900 there has been an increasing number of new forms appearing in the greenhouses each year. About fifty have been named as commercial varieties. Probably almost an equal number have been discarded or are still held for further tests to determine their value. It has been my privilege to study these forms in two ways; first, by frequent visits to the establishments of commercial growers where I have seen them literally by the hundred thousand; second, by assembling at the Brooklyn Botanic Garden a collection of all obtainable varieties for closer study and experiment. This collection now numbers over seventy different varieties, named and unnamed, and I have ordered for delivery in the near future all European forms catalogued, besides commissioning collectors in the tropics to send me wild forms.

The varieties of *N. exaltata bostoniensis* may be roughly classified under three heads: (1) variations which show increase in the amount of division; (2) variations showing increase in the undulation of the pinnae; (3) variations showing various degrees of dwarfing. Besides these, the forking of pinnae and leaf tips, the "fish-tail" variation, as the florist calls it, is also rather common. Perhaps the most interesting fact about these variations is that they are nearly all progressive or orthogenetic; i. e., each new form along any given line seems to carry the potentiality of producing another sport showing the same new character in greater development. This is well illustrated in the series shown in Plate 1.

The forms represented in Plate 1 illustrate progressive variation along the line of increased division of the leaf. The relationships can be well indicated by setting down the technical scientific names of the different varieties pictured with the figure numbers and amount of division.

Fig.	*Name*	*Amount of division*
1.	N. exaltata bostoniensis	1–pinnate
2.	N. exaltata bostoniensis Piersoni	2–pinnate
3.	N. exaltata bostoniensis Piersoni Whitmani	2–3–pinnate
4.	N. exaltata bostoniensis Piersoni Whitmani gracillima	3–pinnate
5.	N. exalt. bost. Piers. (Whitmani?) Smithi Craigi	5–pinnate

It should be noted that the varieties *Piersoni* and *Whitmani* were really separated in origin by another form, *Barrowsi*, which was not available when the illustration was made. The complete history of the origin of the 5-pinnate form, *Craigi*, is uncertain. It may have come through another sport than *Whitmani* but this



Varieties showing progressive Increase in the Division of the Leaf. (Named from right to left)
1, *bostoniensis.* 2, *Piersoni.* 3, *Whitmani.* 4, *gracillima.* 5, *Craigi.*

will serve to indicate the probably course of its evolution. *Smithi*, its immediate ancestor, is a four-pinnate form, which presumably came from a form like *Whitmani* or *gracillima*, if not from one of these. The progressive decrease in leaf-length shown in the illustration is probably not to be considered as progressive dwarfing, but merely as correlated with the increase in division.

The forms represented on the other two plates illustrate variations which can only be briefly indicated here. All of them are Pierson forms (*bostoniensis* of course excepted), i. e., they have originated in the establishment of F. R. Pierson, Tarrytown, N. Y., which has been most prolific of new and interesting varieties.[1]

The origin of *bostoniensis* and *Piersoni* (Plate 2, Figs. 1 and 2) has already been indicated. It may be added that *Piersoni* created a furore in the horticultural world when first introduced but is very little grown now owing to its tendency to revert, or throw once-pinnate leaves together with its twice-pinnate ones. The other two, *elegantissima* (Fig. 3) and *elegantissima-compacta* (Fig. 4), are both direct sports from *Piersoni* in which a greater division of the leaf exists. They thus correspond to *Whitmani* in division. *Elegantissima-compacta* also illustrates dwarfing.

Plate 3 shows another dwarf sport from *Piersoni*, one in which no increase in division has taken place, *superbissima*, (Fig. 3). Figure 5 of the same plate shows *muscosa*, a sport of *superbissima*, showing an increase in division and possibly also further dwarfing.

The other figures of Plate 3 illustrate reversionary varieties of two different forms. "Dwarf Boston"

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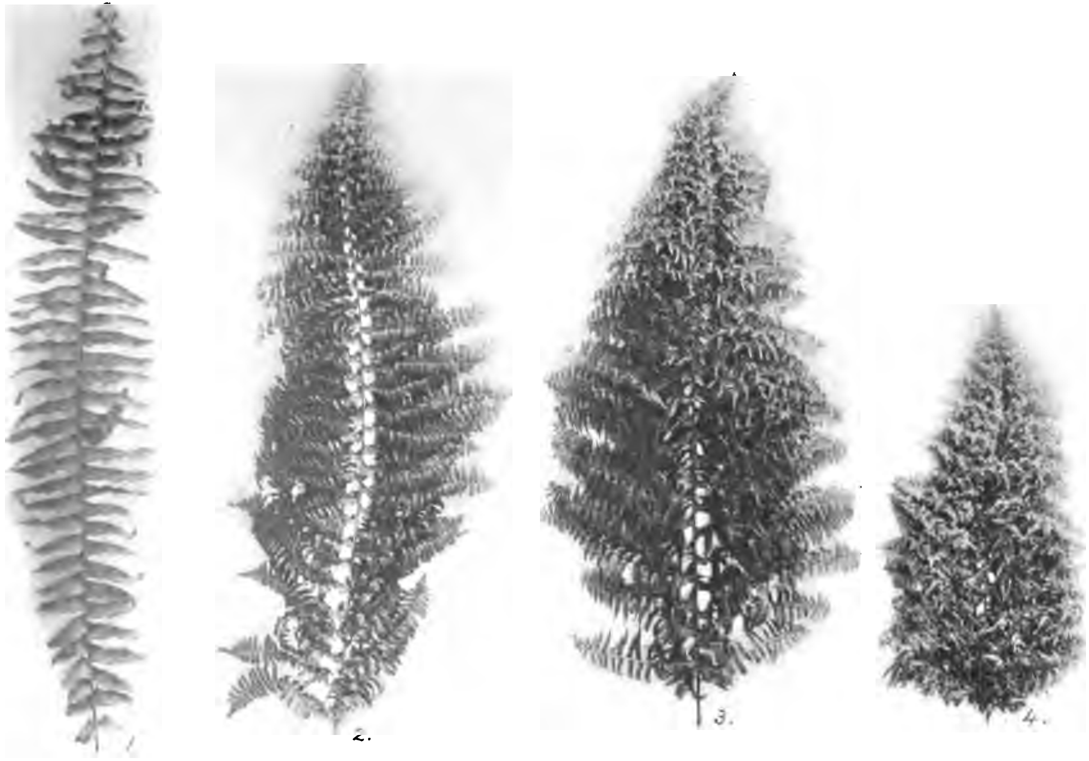
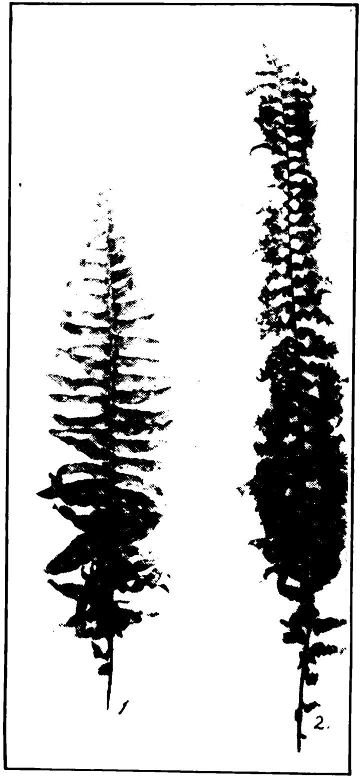
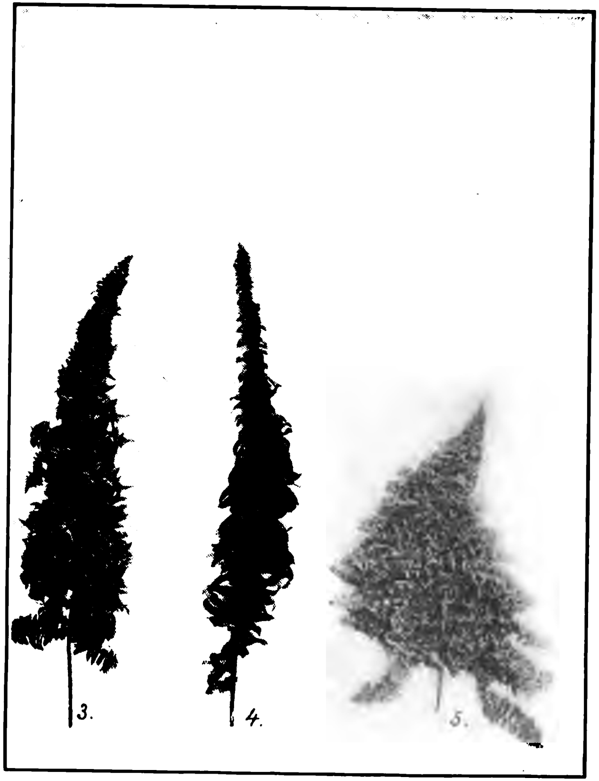
[1] Cf. "Some modern varieties of the Boston fern at their source," Journ. N. Y. Botanical Garden, 16: 194–197, plates 161 and 162. Sept. 1915. The privilege of reproducing these two plates is hereby gratefully acknowledged.



THE BOSTON FERN AND SOME PIERSON VARIETIES
1, *bostoniensis*. 2, *Piersoni*. 3, *elegantissima*. 4, *eleg. compacta*
(Reprinted from the Journ. N. Y. Bot. Gard. 16: Pl. CLXI)





MORE PIERSON VARIETIES OF THE BOSTON FERN

(Fig. 1) and the unnamed sport (Fig. 2) both are sports from *elegantissima-compacta*, the first representing a full reversion to a once-pinnate condition, the second, a partial reversion, since it has lobed pinnae. *Viridissima*, (Fig. 4) is the revert of *superbissima*, and shows the stiff dwarf leaf of this variety together with its twisted pinnae. In general, reversion is a most prolific source of new varieties. All more than once pinnate forms tend to produce reverts but these appear never to go all the way back to *bostoniensis*, nor do they ever exactly agree with each other.

It should be noted that almost all of these varieties are vegetatively produced. Few or no fertile spores develop, the sporangia seeming generally abortive. New plants are grown from runners which spring from near the bases of the leaves.

For house cultivation, the old Boston is still the best. Next come large once-pinnate forms with wavy pinnae, *Harrisi* and *Roosevelti*, and the once-pinnate dwarfs, *Scotti* and Teddy Jr. *Whitmani*, *elegantissima*, and *Scholzeli* are the best sorts of the two to three pinnate. The more finely divided varieties are extremely beautiful but require greenhouse conditions for good development. Plants of these kinds should be renewed from florists' stock from time to time just as one buys cut flowers, only these fern plants will last months instead of days. It may be mentioned finally that the Boston fern with its varieties constitutes the most popular house plant in America today and is grown for this purpose in greater numbers than any other fern or flowering plant. It is safe to say that a million plants are grown and sold in the Eastern States alone every year.

BOTANIC GARDEN, BROOKLYN, N. Y.

Schizaea Pusilla at Toms River

PAULINE KAUFMAN

Among the pleasant days given over to the celebration of the twentieth anniversary of the New York Botanical Garden, September twentieth, nineteen hundred and fifteen, will long be remembered. At about ten o'clock, members and guests of the Torrey Club, numbering fifty-two, left the New Jersey Central station in a special car, for the Pine Barrens of Toms River. The Fern Society was represented by Prof. R. A. Harper, Dr. John H. Barnhart, Mr. O. A. Farwell, Miss Laura M. Bragg, of the Charleston Museum, Mrs. L. Keeler, and Miss I. H. Stebbins, of Rochester, who had been at the Hart's-Tongue hunt. To my regret, I did not meet our President, Mr. Bissell, who, I have since heard, had joined our party in the afternoon. Mr. Long also joined us at the station, which we reached at half past twelve. After our lunch at the Ocean House, we started on our sandy walk. There are many ponds, pools, and sphagnum bogs in this section. Before reaching the first bog, we saw *Eupatorium hyssopifolium* and *E. verbenaefolium*, *Cassia nictitans*, *Arenaria squarrosa*, *Chrysopsis Mariana*, and the rarer *C. falcata*. The exquisite wands of Blazing Star, *Liatris graminifolia*, var. *dubia*, made the places glow with color. It was said that *Eupatorium resinosum* was found. I did not see it, but have read that nowhere in the world, except in the pine barrens of New Jersey, is this plant found. Tufts of *Hudsonia tomentosa* and *ericoides* and the dainty *Polygonella articulata* grow here and there. The first bog, having been reached by this time, gave such treasures as late specimens of the branching white flowered *Sabbatia*, red root, *Lachnanthes tinctoria*, Cranberries, Pitcher plants, the three Sundews, the round leaved, spatulate and thread leaved, a tiny *Xyris*—but no *Schizaea*. On further, walking over Pyxie and Bearberry past *Kalmia angustifolia,* Beach Plum and Huckleberry bushes, from which we took toll, down to the pond. It was very wet there, but a number of people tried their luck. At last the long searched for was found—three plants of the Curly Grass. Mrs. Keeler took first honors by finding two and Dr. Levine the third. In the meantime to those of us who did not want to wade, Mrs. Martin said, "though I have often looked for the fern and never found it, I know a place with a greater diversity of flowers;" and Rev. Dr. Lighthipe said, "and I know a bank whereon *Schizaea* used to dwell." So leaving word for any one to come who cared to, Miss Jud and I followed our leaders, past the Pennsylvania Railroad station, past the mill where pencils and talcum powder are made, seeing en route the beautiful orange polygala and its relative *P. cruciata, Lobelia cardinalis* and the dainty *Lobelia Nuttallii, Aster nemoralis, Solidago odora* and *S. puberula, Rhexia,* the Chain fern *Woodwardia angustifolia, Gerardia purpurea, Bartonia tenella,* and many other good things. The place was bordered with cedar trees. There had been more, but a fire along shore had necessitated the cutting away of many of them. We were this side of a cranberry bog, separated from it by a little ditch. Our position was now on hands and knees, and the hunt began. Illustrations of the Fern were familiar to me and I had long owned a frond, but in spite of this, did not know just what to look for, until Miss Jud announced the first find. Gradually the eye grew accustomed to the tiny green curls, an inch and a half high and about the third of a grass blade in width, which were the sterile fronds, and the tiny brown pinnae in crowded pairs on the top of a longer, straighter frond which was fertile. Miss Jud found a second one, Mrs. Martin and I each found two plants, which we shared with Dr. Lighthipe, who had none.

The ferns were in the sphagnum among Lycopodiums, cranberry, sundews, and many smaller plants. Just at this time, a man came along, with fire in his eye, and told us that no one was allowed on the cranberry bogs. We assured him that we did not want his cranberries, whereupon he said that didn't make any difference. We said we were not harming his berries, and showed him what we were looking for, but you and I can imagine in which of two categories he placed us. However, he left, and if Mrs. Martin had not wanted to get an earlier train we might have made a larger capture. When, on returning, we told of our good luck, others tried theirs, but were not successful. In the sphagnum, which was around my plant, I found another sterile one. Kept wet for days, the fronds took on the exact curl of a corkscrew.

Other plants found were the horned bladderwort and a very tiny one, sand myrtle, *Eriocaulon septangulare*, *Eryngium Virginianum*, with its peculiar blue gray thimbles, St. Andrew's cross, and a great many more. To our regret, the purple Bladderwort was no longer in bloom, and we did not find the lovely Pine Barren Gentian *G. Porphyrio*.

At six o'clock came the call for the homeward journey. Box suppers had been provided, and every detail looked after, by our splendid guide, Mr. Percy Wilson, who will always be associated with a perfect day at Toms River.

NEW YORK CITY

Notes and News

THE FERN-PICKING INDUSTRY. The following item appeared in a Vermont paper some time in the past summer:

CAR LOADS OF FERNS

Over 50 car loads of ferns have been sent this season from Bennington County to refrigerator headquarters in Pittsfield, Mass. Two car loads are sent from Bennington village each day.

An article by F. E. Robertson in *The Vermonter* for October gives some additional information regarding the fern picking industry. He says: "in the towns of Woodford, Searsburg, Stamford and Readsboro over 50,000,000 ferns" (doubtless meaning fronds) "are gathered annually. These have a local value of something over $20,000. These ferns are picked when in prime and tied in bundles of 100 each. The picker is paid about four cents per bundle—a good picker will gather from 10,000 to 12,000 ferns daily."

A correspondent in another part of Vermont, referring to *Dryopteris Goldiana*, says, "I recently shipped 1700 plants to a firm in N. J." and in another part of the same letter, "I am not a collector of plants for sale, but have yielded to the request of florists and removed about 3000" (*D. Goldiana* plants) "from this location taking care that plenty were left to develop."

This sudden activity in the market for wild ferns is not apparently related in any way to the European war and seems likely to have a continuing development. Judging by the fate of certain wild flowers this development will probably be attended with a certain amount of destruction and extermination.

The transplanting of wild ferns for cultivation in well kept gardens is a commendable practice, and the demand for live plants must be strictly limited as they are perennial. The collection of fronds of the evergreen wood ferns may not seriously injure the plants, if it is done in the later part of summer, and if a proper method is used for separating the fronds from the crown.

If some Vermont reader who is in position to observe will report to the JOURNAL the methods and conditions under which this industry is carried on and any apparent effects upon the fern growth of the region, we shall be prepared to advocate suitable conservation measures, in case such action appears to be desirable.

E. J. WINSLOW.

Of further interest in connection with Mr. Winslow's note are advertisements of the following sort which are taken from a florists' trade paper: "Dagger and fancy ferns, finest quality, $1.50 per 1000." "New crop fancy ferns and dagger ferns, $1.25 per 1000." "Dagger fern" is a name for *Polystichum acrostichoides*. "Fancy fern" refers to *Dryopteris intermedia*, which is available for this purpose owing to its evergreen character, an interesting point of distinction from *D. dilatata* and *D. spinulosa*. The leaves collected are finally baled in bales several feet in each dimension, and then shipped to cold storage to be held till called out for the retail florist at so much per thousand leaves.

R. C. B.

HAS ATHYRIUM PYCNOCARPON BEEN FOUND IN NEW JERSEY? If *Athyrium pycnocarpon* (*A. angustifolium*) has not heretofore been recorded from New Jersey, the record may now be entered. On June 19 last the Torrey Botanical Club carried out a field trip for ferns in the woods near West Englewood, N. J. Eighteen species were found, including the species named above, which was not noted as of particular interest. A few weeks ago, however, Mr. Percy Wilson called the writer's attention to the fact that it had apparently never been recorded for New Jersey before. The latest flora dealing with New Jersey, The Flora of the Vicinity of New York by Mr. Norman Taylor, makes no mention of this species, and a brief search in other local floras has failed to show any record of it. Herbarium material of it has been deposited at the New York Botanical Garden.

R. C. B.

American Fern Society

OUR FIRST HONORARY MEMBER. The Index Filicum of Carl Christensen is easily the most indispensable of all fern books for the fern systematist who deals with more than local groups. Add to this his scholarly monographic work on the genus *Dryopteris* and related genera, mainly concerned with American forms, some briefer papers of which have appeared in the pages of the JOURNAL, and we have the basis for his election as an honorary member of the American Fern Society. The Society is honored in his acceptance which appears below.

In Vol. 2, p. 52 of the JOURNAL will be found a biographical sketch with a list (not quite complete) of his papers on ferns up to that time. We expect to publish a complete and up to date bibliography in the next issue. We may hope that future numbers of the JOURNAL may include many more contributions from our first honorary member.

R. C. B.

TO THE AMERICAN FERN SOCIETY:

I take great pleasure in expressing my acceptance of and gratitude for the honor which the American Fern Society has conferred upon me by electing me a honorary member of the Society, and of which I hope I shall prove myself worthy.

I wish that your Society may be continuously growing for the benefit of that branch of botany, that its members and myself are so devotedly studying. I will always be glad to publish in the AMERICAN FERN

JOURNAL smaller contributions relating to American ferns.

CARL CHRISTENSEN.

COPENHAGEN, DEC. 1, 1915.

ANNUAL REPORTS OF THE SOCIETY

Report of the President for 1915

The year 1915 was one of progress for the Society. In my report last year I asked the coöperation of the members in attaining certain results, and I have to thank them for the response made. I asked for help in securing a file of the publications of the Society, with the result that, where two years ago the Society had no records at all, it has today a practically complete file of its reports and publications and will soon have one of the *Fern Bulletin*. I asked that local meetings be held: four have been reported, at three of which it was my privilege to be present. I asked for increased membership, and it has come, largely as a result of the local meetings. I stated that the Council believed that receipts from the sale of back numbers of the JOURNAL should not be used for ordinary running expenses, but set aside to form a special fund against possible future contingencies. This we have been able to do and still pay all bills for the year, with a few dollars to spare.

That these results have been attained is—beside the interest and coöperation of many members—largely because of the efficient work of the editors, the secretary and the men who have served as treasurer. We have been so fortunate as to be able to retain the services of Dr. Benedict as editor-in-chief. We have had four good numbers of the JOURNAL and even better things are planned for the year to come. We have a JOURNAL to be proud of, and the editors would enlarge it at once if the Council did not stint them as to expenditures.

Under the care of Curator Hopkins the Society herbarium has been largely increased, valuable additions having been made during the year, as will be seen from his report.

So much for the year past; now, what of the coming one? I shall be much disappointed if, when I turn over my office to my successor next year, I cannot say that the Society has 300 members in good standing. There is no reason why we should not have that number and more, but the increase must come as a result of the work of individual members. It is planned to enclose two application blanks with the first number of the JOURNAL for 1916 and if the members will see them properly placed, we shall, without doubt, get the desired increase. Members should, where possible, arrange for local meetings. These will be especially valuable if they can have the aid of some local botanical or natural history society. Members are asked to remember the Society fern gardens and send in plants for cultivation in them.

I suspect that to many members the coming of the JOURNAL is almost the only evidence they have of their connection with the Fern Society. This is not as it should be, for one of the first objects of the Society is to promote acquaintance among the members. I can say, personally, that some of the most valued friends I have came to me through such acquaintance. The best wish, then, for the coming year that, as President, I can leave with the members, is that it may bring to each, through our Society, at least one new friend.

C. H. BISSELL, *President.*

Report of the Secretary for 1915

The year has been one of considerable activity in the Society. Four meetings have been held—at Worcester, Mass., Rainbow, Conn., Syracuse, N. Y., and Berkeley, Cal. Three of these have already been reported in the JOURNAL. The fourth, at Rainbow, was an informal one-day field meeting in late June, attended by Messrs. Bissell, Winslow, and Weatherby from among the officers and by about twenty nature-lovers from the vicinity of Hartford. Under the guidance of Mr. Bissell and Mr. H. C. Bigelow, the day was agreeably spent in exploring a tract of woodland remarkable for the number of forms and hybrids of the shield ferns which grew in it. Some of the rarer Botrychiums were also found.

During the year one member, Dr. Charles E. Bessey, has died. Six have resigned: four, after every possible effort to reclaim them, have been regretfully dropped for non-payment of dues. 40 new members have been received of whom one, Mr. Carl Christensen, is an honorary, and one, Mr. Seth Bunker Capp, a life member —in each case, the first of his class. The total number of members, not including the single honorary one, is now (December 31, 1915) 255, the largest in the history of the Society. But it is not enough. Probably it is a comparatively small proportion of the Americans who are interested, more or less, in ferns; and the Society should not be satisfied, nor can it reach its full usefulness, until it has them all.

The annual election brought out the largest vote yet cast—a gratifying indication of active interest on the part of the members. Two amendments to the Constitution were adopted, the text of which follows:

"Add to Article III the following:

SECTION 5. Any eligible person may become a life member on payment, at any one time, of a fee of fifteen dollars, and shall thereafter be subject to no dues or assessments. All such fees shall be held and invested as a permanent fund, the principal of which shall not be expended, but the income from which may be used for the purposes of the Society on vote of the Council. Contributions for the purpose and other available moneys may be added to this fund at the discretion of the Council."

Recommended by the Council.

"Amend Article VI by striking out Section 2 and substituting the following:

This Committee shall nominate officers for the coming year and forward the list of nominees to the President before September first. Any other nominations, if endorsed by three members in good standing and received by the Chairman of this Committee by August twentieth, shall be incorporated in the ballot for that year."

Proposed by R. A. Ware, E. J. Winslow, and H. G. Rugg.

Three species of ferns—*Botrychium simplex, Ophioglossum Engelmanni*, and *Pellaea glabella*—have been offered to members during the year. It is planned to make at least one such offering in each number of the forthcoming volume of the JOURNAL.

C. A. WEATHERBY, *Secretary.*

Report of the Treasurer

I took over the treasury in April, and this report must include the work of my predecessor, Mr. F. G. Floyd, from January until April. I found the books in fine shape, they having been most conscientiously kept by Mr. Floyd. So far as the treasurer is aware, every bill that was incurred in 1915 has been paid, and there are no debts of any sort whatever.* Last year the Society had an available cash balance, after providing for bills contracted in 1914, of $6.05. There is in the treasury today, aside from the Life Membership Fund, $56.34, a gain of $50.29 for the year, a cause for congratulations to the Board of Officers who planned the year's finances. As stated in the report of the Treasurer last year, a plan for a budget was tried for 1915 expenses, the Treasurer being thus able to pay the regular bills of the Society after proper certification without having to send an order around the Council for each bill. The plan has worked well, in only three cases was it necessary to increase budget amounts and those were on account of unforeseen events in the life of the Society.

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*Since writing this report the Treasurer learns that there is a bill not yet presented for plates for No. 4 of the JOURNAL to be paid from the special Illustrating fund given for that object.

The total of original allowances for the budget was $280.00, the actual expenditure on budget account was $278.08. The same plan is to be carried out for the year 1916.

Treasurer's Account from January 1, 1915, to Dec. 31, 1915

Receipts

Cash on hand January 1, 1915		$109.12
Membership dues for 1912	$1.00	
" " " 1913	4.00	
" " " 1914	26.50	
" " " 1915	203.00	
" " " 1916	6.00	
" " " 1917	1.00	
		241.50
Subscriptions " 1915	33.12	
" " 1916	3.26	
		36.38
Advertising		4.00
Special Illustrating fund		11.50
" Gift for Journal		7.50
Sale of Back Numbers of Journal		28.75
Miscellaneous receipts		1.94
		$440.69

Life Membership Fund

Received, 1 Life Membership	$15.00

The income only of this fund is available for expenses.

Disbursements

Bills incurred for Journal in 1914 as per Treasurer's statement of last year, but not paid until after Jan. 1, 1915		$103.07
Expenses for 1915		
President's Expense, Postage	$2.00	
Carried forward	$2.00	$103.07

Brought forward	$2.00	$103.07
Curator's Expense, Supplies	7.40	
Editors' Expense, Posting, Mailing JOURNAL, etc.	16.97	
Treasurer's Expense, Postage and Supplies	16.01	
Secretary's Expense, Postage and Printing	6.03	
Printing Membership Lists and Letterheads	16.50	
Publishing JOURNAL, 4 numbers	208.67	
Incidental Expenses	7.70	
		$281.28
		$384.35
Cash on hand December 30, 1915		56.34
		$440.69

Of the cash balance, $28.75, received from the sale of back numbers of the JOURNAL, is held as a special emergency fund.

J. G. UNDERWOOD, *Treasurer.*

Report of the Curator for 1915

The Society herbarium has grown during the past year and now numbers 2234 mounted sheets. Eight loans were made to members during the year. The exchange department is flourishing and exchanges have been made with twelve different persons since the last report. Members are asked to send a list of their material first, as the department cannot give out rare material and receive none in return.

The collection of Phillipine material, 483 sheets in all, donated by Mr. D. LeRoy Topping and mentioned in the last report, has all been mounted. This collection contains about 180 different species in about 55 genera.

Through an exchange, the Society has received a set of the pteridophytes of the Hawaiian Islands from Mr. C. N. Forbes, Curator of Botany in the Bernice Pauahi Bishop Museum, Honolulu, H. I. There are 259 sheets in this collection, representing 38 genera and 113 species.

Miss F. E. Corne has contributed an interesting set of 30 sheets collected by her in the vicinity of Grafton, Vt.

Mr. B. F. Bush is credited with 8 sheets from Missouri.

When the Society Herbarium was turned over to the present curator some seven or eight years ago the material received, as shown by the report issued shortly after, numbered 553 sheets. During the early part of the present year, in looking over some old reports, it became plainly evident that not all of the Society's herbarium had been transferred to the present curator. Considerable correspondence followed, with the net result that 205 sheets were recovered.

It seems that most of the A. A. Eaton herbarium was acquired by the Gray Herbarium of Harvard University, where it has been gradually incorporated into the general collection, and that, by mistake, a large part of the Society Herbarium went with it. As it was not marked in any way, there was no means of telling the two herbaria apart. When his attention was called to the error, Dr. B. L. Robinson of the Gray Herbarium courteously permitted our Secretary, Mr. C. A. Weatherby, to examine all the available material Moreover, in addition to specimens which could be identified as the property of the Society, he very generously presented to it a set of the remaining Eaton duplicates, the whole amounting to the 205 sheets already mentioned.

This material was mounted by Miss Una L. Foster and Mr. Weatherby, for which the Curator wishes to thank them.

Future mix-ups of this sort cannot occur, as each sheet belonging to the Society is now stamped as its property and numbered. Also, a card index is kept which gives the name, number, and place of collection of each sheet.

Specimens will be determined for members free of charge. All specimens sent in for determination should be accompanied by full and accurate data, and will be placed in the Society Herbarium. All members of the genus *Isoëtes* and all the more critical species of the genus *Equisetum* are especially desired.

L. S. HOPKINS, *Curator.*

Report of the Editors for 1915

Aside from the Society membership there are forty-four paid subscribers for the JOURNAL, chiefly public libraries, colleges, and natural history clubs. Six of these were received during the year 1915 and four were lost, two by withdrawal and two by transfer to the membership list. Many sample copies have been sent to libraries and institutions, but to bring the matter properly to the attention of a periodical committee a personal interview is usually necessary. Members who live in the vicinity of large libraries can do good service for the Society by presenting this matter to the proper authorities. Sample copies will gladly be sent at the request of any member who will undertake this work.

There remain exactly 30 full sets of Vol. I of the JOURNAL among the back numbers held for sale. These will doubtless be exhausted sometime before the end of another five years, so subscribers who wish to fill their sets should act promptly.

From the standpoint of the preparation of the JOURNAL number by number there is little for the editors to report which differs from reports of other years. We find no dearth of copy. In fact, we are usually one or two whole numbers ahead and the major part of every number comes to us unsolicited. There is little question that if finances permitted, we could issue forty or fifty page numbers instead of thirty-two. Judging by a number of commendatory letters and practically none finding fault, the contents of the JOURNAL meet the approval of the members.

The prospects for the present year include two state fern floras, two detailed studies of related ferns, and, we hope, a check list which will bring out the almost complete unanimity which now obtains with respect to the scientific names of our native ferns among the various institutions of the country, as well as serve as a basis for collectors. An interesting suggestion has been made recently that there should be prepared a list of native ferns giving the best common names as far as there are any, and proposing new ones where good ones are lacking. We shall be glad to receive the opinions of members both as to the advisability of such a list and as to names which it should include. Undoubtedly there are a considerable number of members who do not readily accustom themselves to the technical names and who would like a standard list of English synonyms.

Finally we can only reaffirm that we wish to act for the members: to prepare for publication what they send in, and to contribute as opportunity offers to the general knowledge of ferns. We shall accept anything which adds to fern knowledge, or is of interest in this connection—especially checks to pay for more pages or or for more illustrations. For the latter as heretofore our funds are inadequate and before the year is over we shall probably have to ask some contributors to furnish part of the cost of any plates, as well as to contribute toward them ourselves.

R. C. BENEDICT,
E. J. WINSLOW,
C. A. WEATHERBY,
Editors.

Report of the Judge of Elections

TO THE SECRETARY OF THE AMERICAN FERN SOCIETY:

The undersigned, Judge of Elections by appointment of President Charles H. Bissell, respectfully presents the following report of the balloting at the annual election held in October, 1915:

Whole number of ballots cast	108

For President	
Mr. Charles H. Bissell	87
Mr. H. E. Ransier	19
Not voting	2

For Secretary	
Mr. C. A. Weatherby	84
Mr. Stewart H. Burnham	22
Not voting	2

For Vice-President	
Rev. John Davis	73
Mr. Harold W. Pretz	28
Mr. James G. Scott	1
Not voting	6

For Treasurer	
Mr. J. G. Underwood	69
Miss Mina K. Goddard	37
Not voting	2

Election of Carl Christensen as honorary member:	for	100
	against	3
	not voting	5
Amendment to Article III of the Constitution:	for	94
	against	6
	not voting	8
Amendment to Article VI, Section 2 of the Constitution:	for	98
	against	5
	not voting	5

I therefore declare the election of Mr. Charles H. Bissell as President, Rev. John Davis as Vice-President, Mr. Charles A. Weatherby as Secretary, and Mr. Jay G. Underwood as Treasurer, of the American Fern Society for 1916; of Mr. Carl Christensen as an honorary member; and the adoption of the two proposed amendments to Article III and Article VI, Section 2, of the Constitution.

EDWIN C. JELLETT.

GERMANTOWN, PHILADELPHIA, PA.

Dr. A. J. Grout sends an attractive invitation for a field meeting, next July, at his cabin in Newfane, Vt. He writes that he can furnish shelter for about twelve women and an equal number of men, transportation for supplies and guides for excursions and that his welcome holds good for as many days as the party wish to stay. Bedding, food, and, in the case of a very large party, tents would have to be furnished by the visitors. Photographs sent with his letter show an exceptionally beautiful country, and he promises good fern-hunting. Further notice will appear in the next number of the JOURNAL; meantime, the Secretary will be glad to hear from members who think they could attend such a meeting, that tentative plans may be made.

Mr. C. H. Bissell, Southington, Conn., offers *Schizaea pusilla* and *Scolopendrium vulgare* for postage. The number of specimens which he has is somewhat limited, but he will make them go as far as possible, on the principle of "first come, first served."

Will any one who knows the present address of Mr. Herbert M. Mapes kindly inform the Secretary what it is? His address, as last reported, is given in the list of members, but letters sent there have been returned.

American Fern Journal

Vol. 6 APRIL–JUNE 1916 No. 2

Some Interesting Fern Papers in Rhodora

R. C. BENEDICT

During 1915, there were published in Rhodora four papers of especial interest to members of the American Fern Society. The papers were written by Prof. Fernald in connection with his study of the flora of New England and northeastern North America, and contain changes in the naming of some well known species.

The first paper[1] deals with the North American representatives of *Dryopteris spinulosa* var. *dilatata*. On the basis of the pale scales of the American form called var. *dilatata*, together with the glandless indusia, and other facts, the conclusion is drawn that the so-called *dilatata* of eastern North America should be considered as not so closely related to true European *dilatata* as it is to the so-called species, *spinulosa*. His conclusions are partly expressed in the following words: "Except in stature, broader fronds, and more elongate irregularly triangular lower pinnae, the plant is close to *Dryopteris spinulosa* and in our northern forests certainly grades into it. As a variety, however, it deserves recognition as *Dryopteris spinulosa* (Müll.) Kuntze, var. *americana* (Fischer) Fernald." *Aspidium spinulosum*, var. *dilatatum*, forma *anadenium* Robinson is cited as a synonym. True *dilatata* is recognized from the Pacific coast.

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[1] Rhodora 17: 44–48. F 1915.

[Vol. 6, No. 1 of the JOURNAL (pages 1–32, plates 1–3) was issued March 15, 1916.]

The reviewer is especially interested in this group of ferns, and has been making it the object of special study for ten years intermittently. As a result of this study he is obliged to dissent emphatically from some of the conclusions indicated above. The statement that *dilatata* grades into *spinulosa* is, the writer believes, entirely incorrect. The *spinulosa* group is and has been correctly divided into its three constituent forms, *spinulosa*, *intermedia*, and *dilatata*, by general usage in this country. All three forms are well distinguished, specifically, the writer believes.

In its typical development, the distinguishing features of Fernald's var. *americana* as distinguished from typical European *dilatata* are found only in its concolorous scales as opposed to dark striped ones, and its glandless indusia as opposed to glandular indusia. Now there can be no doubt that *dilatata* of eastern North America differs in these particulars from typical *dilatata* of Europe, and may well deserve to be separated as a variety of *dilatata*[2] but that these characters constitute sufficient difference to separate it from *dilatata* entirely and attach it to *spinulosa* seems far from established.

There is scarcely space here for an extended discussion at this time, particularly as the writer hopes to indulge in an extended one in connection with a paper on the *spinulosa* group some time this year. It may be of interest, however, to record some observations made at the Gray Herbarium on the material Prof. Fernald had studied and identified.

1. *Americana* is not limited to America but occurs in Eurasia. That is, in the reviewer's opinion, *dilatata* is represented in eastern North America almost entirely by the form with pale scales and glandless indusia, but this same form of *dilatata* also occurs sparingly throughout its whole range. The leaf form is always the same.

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[2] So separated, it should be called **Dryopteris dilatata var. americana** (Fischer) comb. nov.

2. A considerable number of leaves, without petiole bases, and therefore unidentifiable on scale characters, were placed in the *americana* covers, presumably on indusial characters. The scale character, however, is too uncertain in this group to make it certain that one or more of these leaves might not be glandless and at the same time have dark scales.

A further argument for keeping together *dilatata* and var. *americana* so-called is found in the fact that both are alpine or arctic forms, i. e., they require a cold climate. In Labrador and Greenland it is cold enough at sea level, but farther south in Europe and in America, *dilatata* finds suitable coolness only on mountains. This certainly is not true of *spinulosa* although this form may also occur in cold as well as warmer regions. The inter grading so called between these two is explained by the fact that in the north *dilatata* is sometimes stunted and no larger than *spinulosa*, but the two forms are separable on other grounds despite that, and the reviewer believes that Prof. Fernald has identified as *spinulosa* some leaves which are unmistakably small *dilatata*.

The second paper[3] is also concerned with a plant which is part of a group to which the writer has given considera able study but in this case he does not find himself obliged to dissent. *Botrychium angustisegmentum* (Pease & Moore) Fernald is recognized as a species distinct from *B. lanceolatum* on the basis of spore and sporangium characters, different life zone, and generally slenderer character.

It is a fact that in the case of practically all species of *Botrychium* recognized as common to Europe and America, the European plants are almost invariably thicker and fleshier. If similar forms occur in America they are usually found in the northern portion of the continent. A good illustration is found in the case of

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[3] **Rhodora 17:** 87, 88. Ap 1915.

B. Lunaria, European and in boreal America. A slender form sometimes identified as *Lunaria* is more properly separated as *onondagense*. The same is true for *matricariaefolium*. The writer retained this name for the American plant in the North American Flora because there was not available sufficient material from Europe to justify its separation at that time but it is probably a case similar to that of *lanceolatum* and *angustisegmentum*. It is, however, a mistake, the reviewer believes, to use for this form the name *ramosum* as Dr. Underwood did at one time, and as Dr. Robinson does in the new Gray Manual. The name *ramosum* was based on an abnormal form of another species, as Davenport has pointed out, and as the reviewer took pains to verify some years ago. The form should be called either *matricariaefolium* or *neglectum*.

The fourth paper[4] may well be dealt with before the third because it deals with a case similar to that of *Botrychium angustisegmentum* as compared with *B. lanceolatum*. In this case there is pointed out the differences between the European and American forms commonly known as the ostrich fern, *Matteuccia Struthiopteris*. Prof. Fernald concludes that the American form should bear a distinct name as a species and designates it *Matteucia nodulosa* (Michx.) Fernald. The differences are found in the size, cutting, and habit of growth of the two sorts, and also in the fact that the European form has black scales on the petioles and the American form pale brown ones.

This brings to mind the separation of the American and European royal ferns as *Osmunda spectabilis* and *O. regalis*. It is quite possible that this is justified but satisfactory characters have not yet been pointed out, and the problem is complicated by the fact that *regalis* or some related form is distributed throughout the

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[4] Rhodora **17**: 161–164 S 1915.

American tropics. All these forms, including the European plant, must be studied together before a satisfactory conclusion as to their separateness can be reached. Only on the basis of the "made in America" slogan can they be distinguished at present.

The third paper[5] chronologically has the title "The American variations of *Lycopodium annotinum*." Three varieties besides the typical form are recognized, one, *acrifolium*, being new. The typical form is transcontinental, being distributed from Newfoundland to Alaska and from New York to Washington, also in Eurasia. The variety, *acrifolium*, is cited as from Newfoundland and Connecticut to Michigan, and also in Siberia. It may be pointed out that the differences between these two are exactly analogous to those existing between *L. lucidulum* and its var. *porophilum*. "Varieties *alpestre* and *pungens* seem to be the alpine and boreal extremes of the two woodland plants of more temperate habits, true *L. annotimum* and var. *acrifolium*." It is also noted that "The ranges of these varieties thus fall essentially into the definite groupings—Europe and western America, eastern America and Asia—already familiar in hundreds of cases."

BROOKLYN BOTANIC GARDEN.

An Interesting Hybrid

AMEDÉE HANS.

A very interesting case of accidental hybridization happened among my seedlings some time ago. In a little frame where I used to raise ferns from spores I had, among others, *Scolopendrium* and *Asplenium Trichomanes*. In the *Scolopendrium* pot, by accident, grew a

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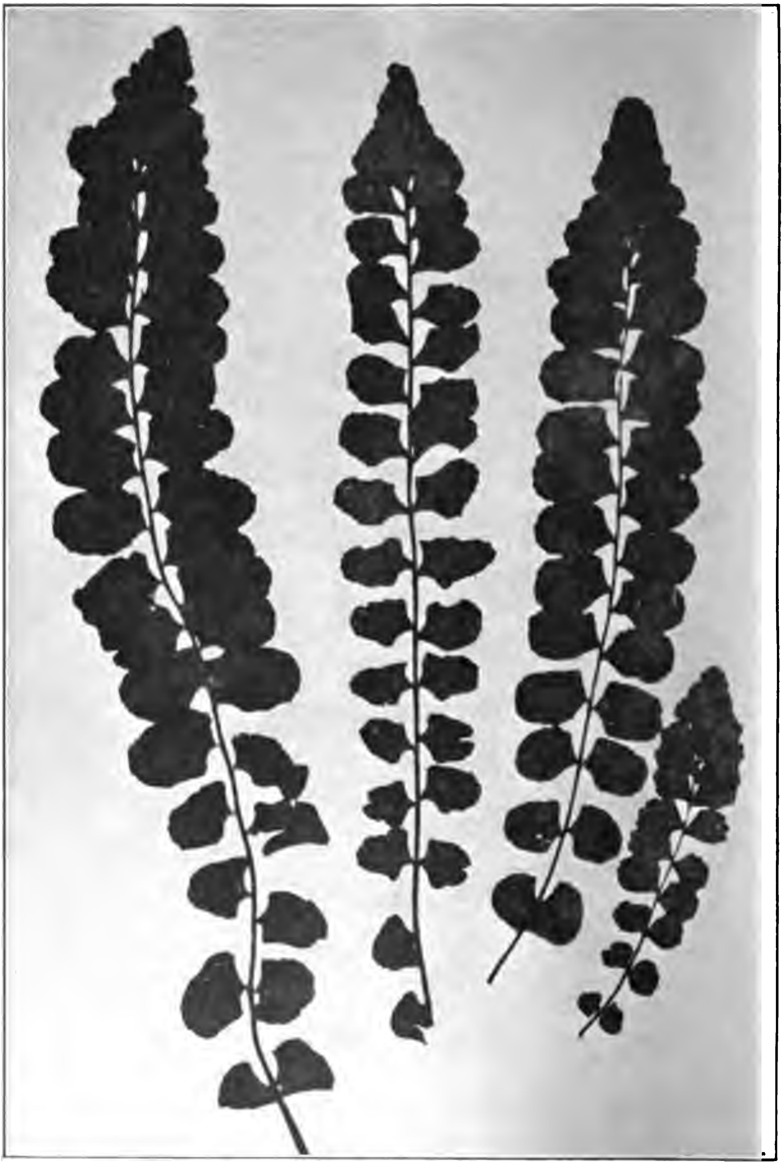
[5] Rhodora **17**: 123–125. Je 1915.



Asplenium Trichomanes, var *confluens*.
Fronds from Mr. Hans's plant, about 5/6 natural size.

few plants of *Asplenium Trichomanes.* There was nothing astonishing about this; the air sometimes carries spores where you do not want them. In taking the plants out, I found one which did not look like the others. I took good care of the little plant and, as it grew up and became well-developed, it turned out to be a plant identical with one which was found in England in a wild state in 1870 by a Mr. Stabler and is now in cultivation under the name *Asplenium Trichomanes,* var. *confluens* Moore or var. *hybridum* Lowe. It is a very distinct, robust growing and nice form. The fronds are much longer and larger than in the type and the leaflets grow together at the top (confluent). Lowe says it is probably a hybrid between *Asplenium Trichomanes* and *A. marinum;* Druery believes it a hybrid between *Scolopendrium* and *Asplenium Trichomanes.*

LOCUST VALLEY, L. I.

Mr. Hans's experience seems to be of exceptional interest. For, judging from Druery's statement,[1] the true nature of var. *confluens* has remained a matter of doubt in England and Mr. Hans's observations go far to prove it a hybrid between the hart's-tongue and the maiden-hair spleenwort, as Druery conjectured. It would thus add another to the rather rare cases of hybridization between plants usually considered to belong to different genera, of which our own *Asplenium ebenoides* is a well-known example.—C. A. W.

Ferns of Duval County, Florida

MRS. M. W. SATCHWELL

There are no rocks or hills in our county; it is bounded on the east by the Atlantic Ocean; the soil is sandy. Conditions are not such as ferns generally like, yet they flourish in abundance. In woods a mile back from the ocean, in a radius of half a mile, eleven species grew.

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[1] In British Ferns and their Varieties, p. 77 (1910).

I have personally found all the ferns mentioned, except two.

1. BOTRYCHIUM OBLIQUUM Muhl.

I have not found this common. At the first station it grew in an old field under a scattering growth of *Magnolia grandiflora*; the location was quite dry. Second station, in a pasture among pine stumps, also dry. Third station, in oak woods near the ocean; there were only two plants, but they were the finest of all.

2. BOTRYCHIUM OBLIQUUM TENUIFOLIUM (Underw.) Gilbert.

In February, 1914, on the outskirts of the city I found a colony of plants new to me, the fruiting fronds had disappeared. I watched the place anxiously; as houses were going up close to the ferns I feared one might be built where the ferns grew before they came up and fruited. However, fortune favored me and I collected a number of good specimens in October.

3. PTERIS AQUILINA L.

4. PTERIS AQUILINA PSEUDOCAUDATA Clute.

In pine woods.

5. OSMUNDA REGALIS L.

6. OSMUNDA CINNAMOMEA L.

7. POLYPODIUM INCANUM Sw.

The Gray Polypody, on trees and roofs of old buildings.

8. POLYPODIUM AUREUM L. Golden Polypody.

The late A. H. Curtiss reported it as "extending northward nearly to St. Augustine." I found it growing on live oaks and cabbage palms near Pablo Beach, also on a large exposed root of *Magnolia grandiflora* on the bank of the St. John's River, at Ortega, six miles from this city. Not common.

9. WOODWARDIA ANGUSTIFOLIA J. E. Smith.

In damp places, common.

10. WOODWARDIA VIRGINICA J. E. Smith.

In swampy places where it is somewhat shady they grow tall and are very dark green. About the margin of ponds in the pine barrens where they are exposed to full sunlight they grow yellow and stunted.

11. ASPLENIUM EBENEUM Ait.

Near the mouth of McGirts Creek, Ortega, close to the water's edge on a pile of old brick was a vigorous growth of several hundred plants. Two years later they were nearly exterminated by a tiny insect.

I also found this fern on the banks of the St. John's river near Ortega.

Just back of the sand dunes at Pablo Beach in the shade of some bushes I found a few plants; they were growing well though the location was uncongenial.

12. ATHYRIUM FILIX-FOEMINA Roth.

Not common, have only found a few stations.

13. POLYSTICHUM ACROSTICHOIDES Schott.

On the damp mossy banks of a creek, the only station found.

14. NEPHRODIUM THELYPTERIS L.

In swamps, common.

15. NEPHRODIUM PATENS Desv.

In rich woods; not very common.

16. NEPHRODIUM FLORIDANUM Hook.

A handsome evergreen fern growing in rich moist places.

17. VITTARIA LINEATA Sm. Grass fern.

Growing on palmettos near the ocean. When the palmettos grew in dry locations the pendent fronds were not more than three inches in length. Where the palms grew in swamps, the fronds were eight or ten inches long.

There are two more that should be added to the list of ferns of this county. A. H. Curtiss, in his article "The Fern Flora of Florida," published in the Fern

Bulletin, April, 1904, mentions *Ophioglossum pusillum* Nutt. "This I once found growing abundantly just west of Jacksonville in a damp sandy spot with *Ludwigia palustris,* etc. It has also been found much further south."

"*Cheilanthes microphylla* Sw.

Found by me about twenty-five years ago, on a shaded shell mound near the mouth of the St. John's River. It seems since to have entirely disappeared."

Curtiss reports *Botrychium obliquum* Muhl., *Asplenium ebeneum* L., *Polystichum acrostichoides* Schott, as found only in northwestern Florida, so I have had the pleasure of adding a new station.

JACKSONVILLE, FLA.

Fern Hunting in Florida in the Phosphate Country

M. A. NOBLE

About seven miles southwest of Inverness, the county seat of Citrus County, following the winding roads of the turpentine orchards and phosphate mines, one comes to a circular basin, whose gently sloping sides are broken by three or four groups of rocks, bearing a scanty growth of ferns, mostly *Asplenium platyneuron* and *Dryopteris patens.* In the center of the basin is a moist spot, with a few clumps of *Woodwardia Virginica.* But one of the rocks, the last to be found, is quite different. Almost hidden in the sloping bank appears a small cave, the earth above it bearing a luxuriant vine, whose leafy stems strung with snowy berries hang like a curtain over the entrance. A few irregular rocks form a rude stairway down to the mouth of the cave. Among these grow *Dryopteris patens, Asplenium platyneuron,* and *A. parvulum.* Overhead is a low arch of rock, completely covered with the moss-like fronds of

Asplenium myriophyllum. The sight was well worth the ride through hot sunshine, followed by soaking rain.

At about the same distance southward from Lake Tsala-Apopka is an interesting fern hammock. As this term is frequently misunderstood, it may be well to borrow a definition from a Report of the State Geological Survey. "A hammock is nothing more nor less than a certain type of vegetation; namely, a comparatively dry soil (or at least not wet enough to be called a swamp), in a region where open pine forests predominate. The ground in such places is always covered with more or less humus derived from the trees, but immediately under the humus the soil may be either sand, clay, marl, or limestone."

After a long ride through the "cut-over" lands of several phosphate plants, where the stumps of the dead pine trees rise at intervals over the low oak scrub, the lofty trees and the green leafage of the hammock is a welcome sight. In this moist shade are jagged, irregular rocks covered with ferns. On fallen trees, and along the lofty branches, droop the graceful fronds of *Polypodium plumula;* while in the crevices of the rocks, and on the crags, thick as grass, grow *Dryopteris patens; Asplenium platyneuron,* with its brown stipes; *A. parvulum,* with shining black stipes, and very narrow fronds; *Adiantum tenerum,* so strong and tall that it seems abnormal in outline; *Pteris Cretica,* with long lance-like pinnae appearing like some stout, short-bladed grass; *Asplenium firmum,* well-named from the plain, undivided form of its pinnae; and, most beautiful of all, the delicate, feathery *Asplenium myriophyllum.*

A few miles further south, following the track of the Atlantic Coast Line, is the flag-station of Pineola: no town, nor post office, but simply a station at the southern edge of Citrus County. About a mile to the east of the station, and near the left bank of the Withlacoochee

River, is a wonderful rocky hammock; one writer calls it "a Paradise of ferns." Here are all the rock-loving ferns of the West Coast that can be found in this latitude, among them the rare creeping fern with so many different names of which the most recent is *Goniopteris reptans*. It has two sorts of fronds, one erect and stout, the other long and tapering, and bending over to the ground to take root like the well known Walking Leaf of the Northern woods.

Another fern of unusual appearance is the *Tectaria trifoliata*, with fronds 12′–18′ long, 6′–12′ broad. It has scant resemblance to the usual form of a fern, but the large round sori are very evident and unmistakable.

INVERNESS, FLA.

The Ferns of Greene County, Missouri

PAUL C. STANDLEY

Greene County lies in the southwestern part of Missouri, its western and southern borders being about 55 and 40 miles distant, respectively, from the Kansas and Arkansas borders. It occupies the Missouri summit of that geologically most ancient part of the central Mississippi Valley, the Ozark Uplift. The central and western parts of the county consist chiefly of a nearly level prairie, given over to agricultural uses and now possessing but little of the original forest, while the eastern, northern, and southern parts are composed largely of low, rocky, thinly forested hills. The rocks are chiefly Carboniferous and Ordovician limestones, but sandstone is found occasionally.

The flora of this part of Missouri possesses many features of interest, for this county is one of those several hundreds in the United States which are "peculiar" in being the meeting point for the eastern, western, northern, and southern floras. It is a fact, nevertheless, that the flora of Greene County does exhibit an interesting mixture of certain eastern, western, and southern elements, as might well be expected from its geographic position. This is not as well shown, however, by the ferns as by the flowering plants; nor do the former include more than one or two particularly interesting species. The phanerogamic flora consists chiefly of typically eastern plants which extend to the Atlantic coast, some of them being here near the western limit of their range, such as *Hydrastis canadensis*, *Caulophyllum thalictroides*, *Bicuculla cucullaria*, *Spiraea alba*, *Micranthes virginiensis*, *Rhexia virginica*, *Erigenia bulbosa*, and *Cynoxylum floridum*. Associated with the eastern plants are many that are southern or western in their distribution, like *Callirrhoe digitata*, *Cissus ampelopsis*, *Psoralea pedunculata* and *P. tenuiflora*, *Kneiffia linifolia*, *Megapterium missouriense*, *Mentzelia oligosperma*, *Ambrosia psilostachya*, *Bumelia lycioides*, *Androsace occidentalis*, *Salvia Pitcheri*, *Evolvulus argenteus*, *Manfreda virginica*, and *Othake callosum*. The region is particularly rich in species of Crataegus.

Twenty-six species of ferns and fern allies are known to grow in the region under discussion, a number in which it will compare favorably with most areas of similar size in the Mississippi Valley. Most of the species have a wide range in the eastern United States, but a few are of less general distribution. Several which are common in the East are rare or local in this part of Missouri. Only one of the species listed, *Filix fragilis*, is found, except perhaps rarely, in the prairie region of Greene County, the others being restricted to the wooded hills and valleys.

In addition to Greene County, the writer has included the region about Graydon Springs, Polk County, only a few miles to the north, a locality of particular interest because of the large exposures of sandstone, resulting in the development of a peculiar flora similar in many respects to that of the serpentine barrens of Pennsylvania and Maryland. One of the most interesting plants is *Selenia aurea*, a southwestern crucifer of extremely local occurence. The sandstone deposits here are of comparatively recent formation, marking the course of a large river long since extinct. In the sandstone along the old river-bed one finds many impressions left by trunks and branches of trees, as well as other remnants of vegetation.

In 1904 Mr. S. F. Prince published[1] a list of 17 species of ferns from the vicinity of Marble Cave, Stone County, south of Greene County. All of the species listed except one, *Asplenium Ruta-muraria*, occur in the area here treated.

1. NOTHOLAENA DEALBATA (Pursh) Kunze. This is a southwestern species which reaches the northeastern limit of its range in southern Missouri. It is said to occur in Greene County at several places along Sac Creek, but the writer has found it but once, at the Matherly Bluffs along the Sac near the northern edge of the county. Here it grows in a most arid environment, in pockets in the face of magnesian limestone cliffs, exposed to the direct rays of the sun. In very dry weather the fronds shrivel, to expand again when moisture is abundant, much like the resurrection plant of the Southwest. The writer has seen *Notholaena dealbata* growing abundantly in a similar situation in southern New Mexico upon rocks of almost exactly the same appearance. It seems to be confined naturally to clefts of limestone rocks; but in spite of this, one instance in Missouri is known to the writer in which plants were transplanted to ordinary garden soil, on the north side of a house, and continued to thrive for several years.

2. ADIANTUM PEDATUM L. Common in many places in damp woods, either along small streams or on northward slopes.

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[1] **Fern Bulletin 12: 72–77.**

3. **ADIANTUM CAPILLUS-VENERIS** L. Collected on cliffs along the James River near the southern boundary and possibly inside the county. This fern apparently is local and certainly most elusive. Although he has botanized in regions where it is known to occur, the writer has never been able to find it growing.

4. **PTERIDIUM AQUILINUM** (L.) Kuhn. Abundant locally, especially in the northern part of the county. It grows usually in rather dry soil in thin scrub-oak woods. The habitat of this species in Missouri and in Maryland appears very different from that in which the subspecies *pubescens* occurs in the Rockies. There the bracken is found in comparatively damp woods, in New Mexico under aspens, but, of course, the actual rainfall in such situations is much lower than in the apparently dry woods of the East.

5. **CHEILANTHES FEEI** Moore. Collected in crevices of dry limestone cliffs near Willard, but said to grow also on sandstone in this part of Missouri.

6. **CHEILANTHES LANOSA** (Michx.) Watt. On sandstone cliffs at Pearl, and at Graydon Springs, Polk County. The species is rather rare in this region.

7. **PELLAEA ATROPURPUREA** (L.) Link. Very common nearly everywhere except on the prairie, frequenting limestone cliffs or very stony, shaded ground. It often occurs in arid situations; the plants are then depauperate and the fronds shriveled. The species is not confined to calcareous soil, for at Graydon Springs it is plentiful on sandstone, in rather moist places.

8. **ASPLENIUM BRADLEYI** D. C. Eaton. There is a specimen of this in the U. S. National Herbarium collected at Cave Spring by Mr. J. W. Blankinship in 1893. The writer has botanized about this locality several times and has searched for this fern, but without success. No doubt it is very rare here, and it is one of the rarest ferns of the Eastern United States. In Gray's

New Manual the range is given as "On rocks, e. N. Y. to Ky., 'Mo.,' and southw." There is no longer reason to question its occurrence in Missouri, for the specimen from Greene County is undoubtedly this species. Presumably it occurs here on limestone, for all the rocks in the vicinity are calcareous.

[*Asplenium pinnatifidum* was reported from this county in Tracy's Check-list of Missouri Plants,[1] but probably the report is based upon an incorrect determination.]

9. ASPLENIUM PLATYNEURON (L.) Oakes. One of the most frequent and abundant ferns of the region, occuring in the woods nearly everywhere. It is confined to calcareous soil or rocks, preferring considerable moisture, but is able to grow in comparatively arid situations.

10. ASPLENIUM PYCNOCARPON Spreng. In Greene County this fern is not common, but it occurs in a few places in the hilly country along the James River, usually in low damp ravines. In Camden County, Missouri, east of Greene County, it is very abundant in places, especially in the limestone sinks so characteristic of that region. The writer has seen it there densely covering areas of an acre or more in extent to the exclusion of nearly all other vegetation.

11. ASPLENIUM RESILIENS Kunze. This is one of the rarest ferns of the region and the writer has found it in only a single locality, along the Sac a few miles northwest of Springfield, where it grows in deep shade in recesses of the northward slope of a low bank, the individuals being rather numerous. In the writer's mind this plant is associated with mosquitoes, for these shaded banks are infested with swarms of them, which add little to the pleasure of fern collecting in this particular locality! Another rare plant of the immediate vicinity is *Caulophyllum thalictroides*.

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[1] P. 104.

12. ASPLENIUM TRICHOMANES L. According to notes by Mr. Blankinship this is found in a few places along the James River. The writer has never found it and has seen no specimens. It may be that the material so identified is really *A. resiliens.*

13. ATHYRIUM FILIX-FOEMINA (L.) Roth. The lady fern has been collected only at Pearl, probably in sandstone soil. Specimens in the Drury College herbarium at Springfield were gathered here by Mr. Blankinship in July, 1889.

14. CAMPTOSORUS RHIZOPHYLLUS (L.) Link. The walking fern is rather local, but often occurs in considerable abundance. It is confined to limestone boulders or cliffs, invariably in moist shaded situations.

15. POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. Widely distributed and often abundant in damp shaded places. It is found in both calcareous and sandy soil.

16. DRYOPTERIS HEXAGONOPTERA (Michx.) C. Chr. Rather abundant locally. It occurs in many places along the James in damp woods, and the writer has collected it near Strafford, where it grew on a rather dry, steep, stony hillside in thin oak woods.

17. DRYOPTERIS MARGINALIS (L.) A. Gray. This has been found in only two localities, at Pearl and at Graydon Springs. It is rare at Pearl, where only a few plants were seen, these on limestone cliffs along a creek. At Graydon Springs it is more plentiful, growing on shaded limestone cliffs.

18. FILIX FRAGILIS (L.) Underw. This ubiquitous plant is the commonest fern in this region, as it is in many other parts of the United States. It is seen oftenest on limestone cliffs, but it will grow almost anywhere in damp woods. The writer has seen it growing luxuriantly under plank sidewalks in Springfield. It often persists for a long time after timber has been cleared away, in open fields.

19. FILIX BULBIFERA (L.) Underw. Much less abundant than the preceding species, but not rare. It frequents moist, shaded, limestone cliffs, and is one of the associates of *Asplenium resiliens*. The pendent fronds sometimes reach a large size and are very freely bulbiferous.

20. WOODSIA OBTUSA (Spreng.) Torr. Rather common on shaded cliffs, frequently associated with *Filix fragilis*. Along the James it grows on limestone, but about Pearl it inhabits sandy soil.

21. ONOCLEA SENSIBILIS L. Known only from Pearl and Graydon Springs. In both cases it grows in sandy soil in thin woods, near the edge of small streams. At one place near Graydon the writer has seen it in a marsh that doubtless is underlain by limestone.

22. OSMUNDA CINNAMOMEA L. Apparently this species is confined to sandy soil, and occurs only in the vicinity of Pearl and Graydon Springs. It is found in thin white oak woods or along sandstone cliffs. At Eudora, near Graydon, it is most abundant, the plants often reaching a large size and forming large colonies.

23. OSMUNDA REGALIS L. So far the royal fern has been collected only at Graydon Springs, where it grows in a restricted area in sandy soil along the edge of the creek. Conditions at Pearl are almost exactly the same, but while all the other ferns partial to acid soil are found there, this appears to be lacking.

24. OPHIOGLOSSUM ENGELMANNI Prantl. Like the more widely dispersed *O. vulgatum* elsewhere, this plant is very local in Greene County. Isolated colonies are found in several places along the Sac north and west of Springfield, and a few very near the city. The writer has found it only in thin, dry oak woods, usually on rather exposed grassy slopes.

25. BOTRYCHIUM VIRGINIANUM (L.) Sw. Very common in rather damp oak woods in nearly all parts of the region.

26. EQUISETUM HYEMALE L. Only this one species of *Equisetum* is known to occur in the county and it is not abundant, being confined to the low ground along the edges of the larger streams like the James and Sac.

U. S. NATIONAL MUSEUM,
WASHINGTON, D. C.

A Collector's List of New Jersey Ferns

MACY CARHART

The following list represents collections made by the writer in the vicinity of Keyport and in other parts of New Jersey. Seventy-nine different forms are included, of which sixteen are in the genera *Equisetum, Lycopodium, Selaginella* and *Isoetes,* leaving the number of ferns at sixty-three. The list includes all but four of the fifty fern species recorded from New Jersey in Norman Taylor's recently published Flora of the Vicinity of New York and to a certain extent supplements that work, which takes no account of varieties and gives no localities at which the hybrids mentioned have actually been found. One of these hybrids, named here as *Dryopteris Clintoniana* × *cristata,* has never been regularly described,[1] but the plant is fairly distinct and not difficult to recognize. The plants mentioned in the list are all represented by herbarium specimens.

Polypodium vulgare L.; Keyport, rare; northern parts, common.
Phegopteris polypodioides Fée; Newton, one colony.
" *hexagonoptera* Fée; Keyport, common.
" *Dryopteris* (L.) Fée; Newton, Phillipsburg.
Adiantum pedatum L.; Keyport, frequent.

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[1] Though mentioned in the Flora of Vermont, Vt. Agr. Exp. Sta., Bull. no. 187, 155. (April, 1915.) C. A. W.

Pteris aquilina L.; Keyport, common.
“ *pseudocaudata* Clute; Toms River.
Cheilanthes lanosa (Michx.) Watt; Milford, Great Notch.
Pellaea atropurpurea (L.) Link; Newton, Phillipsburg.
Woodwardia virginica (L.) J. E. Smith; Keyport, frequent.
“ *areolata* (L.) Moore; Keyport, common.
Asplenium pinnatifidum Nutt.; Blairstown, one colony.
“ *ebenoides* R. R. Scott; Springdale near Newton, two plants.
“ *Trichomanes* L.; frequent in northern parts.
“ *platyneuron* (L.) Oakes; Keyport, common.
“ “ *serratum* (E. S. Miller) B. S. P. Keyport, one colony, about twenty plants.
“ *montanum* Willd.; above Phillipsburg, one colony, 30-40 plants.
“ *Ruta-muraria* L.; Phillipsburg, Newton.
“ *acrostichoides* Sw.; Keyport, frequent.
“ *Filix-foemina* (L.) Bernh.; Keyport, common.
Camptosorus rhizophyllus (L.) Link; northern parts of state, frequent.
Polystichum acrostichoides (Michx.) Schott; Keyport, common.
“ “ *incisum* A. Gray; Keyport, occasional.
Dryopteris Thelypteris (L.) A. Gray; Keyport, common.
“ *simulata* Davenp.; Keyport, one colony, six plants; Morganville, abundant.
“ *noveboracensis* (L.) A. Gray; Keyport, common.
“ *marginalis* (L.) A. Gray; Keyport, occasional.
“ “ **elegans** (J. Robinson) n. comb. Lambertville.
“ *Goldiana* (Hook.) A. Gray; Lodi, Newton. Apparently not previously reported from Bergen Co.

Dryopteris cristata (L.) A. Gray; Keyport, occasional; common northward

" *Clintoniana* (D. C. Eaton) Dowell; Lodi; Morganville. According to Taylor's Flora, previously known from only one station in the coastal plain and not recently collected there.

" *spinulosa* (Muell.) Kuntze; Keyport, Lodi.

" *intermedia* (Muhl.) A. Gray; Keyport, frequent; common northward.

Near Keyport there is an unusually large form of this species with tripinnate fronds which probably is *Aspidium spinulosum*, var. *concordianum* (Davenp.) Eastman of Gray's Manual.

Dryopteris dilatata (Hoff.) A. Gray; Lake Hopatcong.

" *cristata* × *intermedia* Dowell; Keyport, Lodi, Lake Hopatcong.

" " × *marginalis* Davenp.; Lodi, Lake Hopatcong.

" *Clintoniana* × *intermedia* Dowell; Lodi.

" " × *marginalis* Slosson; Lodi.

" " × *Goldiana* Benedict; Lodi.

" *Goldiana* × *marginalis* Dowell; Lodi.

" *cristata* × *Goldiana* Benedict; Lodi.

" " × *Clintoniana;* Lodi.

" *intermedia* × *marginalis* Benedict; Lake Hopatcong.

Cystopteris bulbifera (L.) Bernh.; Newton, Phillispburg.

" *fragilis* (L.) Bernh.; Keyport, frequent; common northward.

Woodsia ilvensis (L.) R. Br.; Pompton, Montclair Heights.

" *obtusa* (Spreng.) Torr.; Keyport, rare; frequent northward.

Dicksonia punctilobula (Michx.) Gray; Keyport, common.

Onoclea sensibilis L.; Keyport, common.

" *Struthiopteris* (L.) Hoffm.; Lambertville.

Osmunda regalis L.; Keyport, common.
“ *Claytoniana* L.; Keyport, frequent.
“ *cinnamomea* L.; Keyport, common.
“ “ *frondosa* Gray; Lodi.
Ophioglossum vulgatum L.; Lodi.
Botrychium obliquum Muhl.; Keyport, frequent.
“ *dissectum* Spreng.; Keyport, frequent.
“ “ *elongatum* Gilbert & Haberer; Keyport, two plants.
Botrychium ternatum intermedium D. C. Eaton; Newton, Morganville.
“ *virginianum* L.; Keyport, common.
Schizaea pusilla Pursh; Toms River.
Lygodium palmatum (Bernh.) Sw.; Keyport, occasional.
Equisetum arvense L.; Keyport, common.
“ *hyemale* L.; Keyport, Phillipsburg.
“ *sylvaticum* L.; Lodi.
Lycopodium lucidulum Michx.; Keyport, frequent.
“ *alopecuroides* L.; Toms River.
“ *inundatum* L.; Keyport.
“ “ *Bigelovii* Tuck.; Keyport, frequent.
“ *adpressum* L. & U.; Keyport, frequent.
“ *clavatum* L.; Newton.
“ *obscurum* L.; Keyport, frequent.
“ “ *dendroideum* (Michx.) D. C. Eaton; Keyport, frequent.
“ *carolinianum* L.; Toms River.
“ *complanatum flabelliforme* Fernald; Keyport, occasional.
Selaginella rupestris (L.) Spring; Montclair Heights.
“ *apus* (L.) Spring; Keyport.
Isoetes riparia Engelm.; Camden.
“ *echinospora Braunii* (Dur.) Engelm.; Lake Hopatcong, Budd's Lake.

KEYPORT, N. J.

Notes and News

A Fern Catalogue which is Fern Literature. A dealer's catalogue which contains names of nearly two thousand species and varieties of ferns with very many illustrations, and which sells for two shillings is really worth a place in a botanical library. H. B. May & Sons, The Nurseries, Upper Edmonton, England, issue such a catalogue. Although it is primarily of interest from the point of view of private fern growers such as are common in England, there are some points of value for American fern students.

Ferns are classified from a horticultural standpoint in three groups: "stove" ferns, which require winter temperature of from 55 to 65 degrees Fahrenheit; "greenhouse" ferns which need from 45 to 55 degrees in winter; and hardy ferns which can stand winter cold out of doors.

In the list of hardy ferns are included several hundred species and varieties. Of course, not all that are hardy in England would be hardy in all parts of the United States, but any one here interested in growing hardy species could add a considerable number to his list. The list of hardy forms includes as might be expected numerous varieities of common species. For example, there are 139 varieties of lady fern, and 109 of hart's-tongue, besides numerous forms of male fern, et al.

Not all the hardy forms are varieties, however. One finds here American forms which the names do not readily identify, as "*Aspidium uliginosum*," "*Lastraea marginalis robusta*," "*Athyrium Michauxii*." It may interest readers to know that *Osmunda regalis*, the European, and *O. spectabilis*, the American form, are kept separate; similarly *Struthiopteris germanica* and *S. pennsylvanica*, and the American and European forms of the *Dryopteris spinulosa* group.

R. C. B.

FALL FRUITING OF THE INTERRUPTED FERN. We have a few plants of interrupted ferns (*Osmunda Claytoniana* L.) in one corner of our yard. Last season they fruited twice.

In looking through my diary, I read: "April 10th: interrupted ferns coming up." They fruited in May. We had a wet season and the plants were in good condition all summer. In September they put up new fronds, both fertile and sterile, not quite as tall as the first set, but well developed fronds.

I have never found the var. *dubia* A. J. Grout. In fact, I have never found the slightest variation in the interrupted fern. In its near relative, the cinnamon fern, we find the form *frondosa*, and plants with the fronds incised are quite common, but with the interrupted fern when we see one we see them all so far as my observation goes.

In the *Fern Bulletin* Vol. XV, No. 1, is an article on the fall fruiting of the cinnamon fern by Prof. Clute. In the southern states it has the habit of fruiting in the fall. This has been noted from a number of states, but not reported from the north.

It would be interesting to hear if any member of the society has noticed the interrupted fern fruiting twice in one year.

H. C. BIGELOW.

Apropos of *Ophioglossum*, the members of the Fern Society may be interested in my observations. I have collected it but once, in a wet place in an old mowing lot on an abandoned farm at 1500 ft. altitude. The place had had no cultivation for 50 years or more, but hay had been cut nearly every season. My specimen was in the bog. I could never find another.

A. J. GROUT.

Although a number of American florists have cultivated the hart's-tongue fern, there has been doubt whether any of their stock was derived from native American plants. We know now that there will soon be one undoubted American strain on the market. At the time of the Society's field meeting last summer, fruiting fronds of the hart's-tongue were sent from Jamesville, N. Y. to A. M. Davenport, Watertown, Mass., and from their spores he now has five or six hundred plants in the prothallial stage or showing the first leaf.

QUERIES AND HINTS FOR THE FERN BOYS AND GIRLS, by an old-fashioned fern-lover.

What is the rarest world fern? Is it *Asplenium Seelosii*? "The rarest, most circumscribed of any known European fern. Only in the Dolomites of South Tyrol." (Hooker.) Or is it *Aspidium haleakalense*? "Halfway up the volcano, Hawaii. Nowhere else in the world." (Hitchcock.)

What is the rarest New England fern? Is it *Aspidium fragrans*? Who knows it well? Who appreciates it fairly? Who has succeeded in cultivating it? With what food? In what circumstances? What are its relatives? Has any other plant its peculiar perfume? When is that perfume at its best? (I gathered it once when it was *delicious* and it lasted for weeks.) Has any other fern its viscidity? Is it not more like the *Woodsias* than the *Aspidiums*? What are its ancestors?

Who is studying fossil ferns?

J. A. BATES.

A FOSSIL FERN FREAK. In a collection of fossils from Alaska assigned to Dr. Hollick of the New York Botanical Garden for study there was found an impression of a fern leaf which demonstrates that freak forms occurred in the past as well in modern times. The leaf in question represents a once-pinnate type but shows in some of its pinnae a second grade of division, a variation which is very common in certain forms of *Nephrolepis*, the genus to which the Boston fern belongs.

FERNS AS WEEDS. Farmers' Bulletin number 687 deals with the "Eradication of ferns from pasture lands in the eastern United States." Two of our friends are noted as especially troublesome, viz., *Dennstaedtia punctilobula* and *Pteridium aquilinum*. Three others, *Onoclea sensibilis, Dryopteris thelypteris*, and *Osmunda cinnamomea*, are named as sometimes troublesome. *Dennstaedtia* is the most frequent fern weed in eastern states; *Pteridium* in the west. The brake usually occupies clearings in the Adirondacks though the land in this case was probably not being used for any stock.

Two main methods of eradication are urged: first by spraying with salt or other plant poison solution; second by repeated mowing, two or three times being ordinarily enough. Another method suggested is really a combination of these two and consists of sprinkling salt for stock among fern growths. In their eagerness for the salt the cattle would practically destroy the leaf growth of the ferns, but there would be also some loss in salt which the cattle would be unable to get.

RUTH HOLDEN: THE ANATOMY OF A HYBRID EQUISETUM.[1]

A preliminary note on this subject by the author was mentioned in an earlier number of the FERN JOURNAL.

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[1] *Am. Jour. Bot.* 2: 225. May 1915.

In the present paper she presents detailed evidence derived from a study mainly of stem anatomy, both internal and external, that *E. variegatum* var. *Jesupi* is a hybrid between *E. hyemale* var. *affine* and *E. variegatum*. For this conclusion she gives the following reasons: "(1) It has some of the characters of *E. variegatum*, some of those of *E. hyemale*, and some that are intermediate between the two. (2) A large number of its spores are abortive."

The trolley cars and billboards in Queen Elizabeth's time, in place of endorsements of So-and-so's Talcum Powder for the ladies, must have recommended the use of Whozis's Fern Ashes. At least that is the inference to be derived from a passage in Ben Jonson's "The Devil's an Ass," in which fern ashes are named as one of several aids to beauty recommended by no less a person than one of Satan's subordinate devils who was sojourning in human form for a brief period. Cannot some reader of the Journal follow up this reference and determine just what species was used?

Members of the Fern Society, especially those who attended the Syracuse meeting last summer, will be sorry to learn that the tract of about 700 acres about East Green Lake and White Lake near Jamesville, N. Y., which contains some of the best stations for the hart's-tongue and *Botrychium onondagense*, has been sold to a cement company, and that its many features of scientific interest are likely soon to be obliterated. An unsuccessful attempt was made to secure this tract and add it to the State reservation already existing at West Green Lake.

American Fern Society

It was intended to offer to members in this number specimens of *Dryopteris cristata* × *marginalis,* but that offering has been postponed in favor of a larger scheme. It is now proposed to issue sets of all *Dryopteris* hybrids of which sufficient material can be obtained, together with typical examples of the parent species for comparison. These sets will contain at least fifteen specimens, carefully determined (at least in part by Dr. Dowell, who has made *Dryopteris* hybrids a special study), will have special labels with printed heading and will be sold, to members of the Society and institutions which subscribe to the JOURNAL only, at two cents per sheet, plus postage. Mr. H. C. Bigelow, 22 Glen St., New Britain, Conn., has kindly agreed to take charge of preparing the sets for the Society. Orders should be sent to him now and, in case there is not enough material to go around, will be filled in the order of their receipt. Barring accident, sets will be ready for distribution in the fall.

SUMMER MEETINGS. In accordance with Dr. A. J. Grout's invitation, mentioned in the last number of the JOURNAL, a field meeting will be held at his cabin in Newfane, Vt., during the week of July 17th. The meeting will be partly a camping-out affair, but, unless the party is large, nothing extra but blankets will probably need to be carried in. Many of the more northern ferns, including *Polystichum Braunii* and a good representation of Lycopodiums, are to be found in the vicinity. Some members of the Society once saw there more of the lance-leaved Botrychium than they had ever expected to see in their lives. Dr. Grout writes that the equipment of his cabin includes "1 panoramic view, 3 states and 40 townships; 1 hermit thrush chorus at evening, finest on the continent; and a private lake of 3 acres" in which pickerel and bull-heads can be caught. He does not state whether conscription will be resorted to in order to get the bull-heads cleaned. Mr. Leston A. Wheeler, Townshend, Vt., has consented to take charge of the arrangements for the meeting, and members who plan to attend—and we hope there will be a good number of them—should notify him and can get detailed information from him.

THE SOCIETY FERN GARDEN AT THE BROOKLYN BOTANIC GARDEN

By our arrangements last year with the Brooklyn Botanic Garden it was ageed that this year should see the beginning of a special fern garden to contain a collection of native hardy ferns and to include any plants which members of the American Fern Society might send in as a Society Fern Garden. One of the main ideas back of the plan was to provide a repository for plants of rare forms such as hybrids, which in the woods are liable to be lost sight of; another idea was to build up as complete a collection of native hardy ferns as possible. The purpose of the garden has this spring been extended to make it include the assembling of a collection of hardy ferns in general, the idea back of this being to make it possible for anyone interested in fern gardens to see the various species which are available. The Botanic Garden will this year arrange to obtain the various introduced species offered by American dealers.

The plot of ground where the garden is to be constructed is about fifty by one hundred feet, and lies on a slight slope with an easterly exposure. At present it is covered with some scrub trees and bushes, but these will gradually be replaced by trees for permanent planting. In the meantime necessary shade is already present. The actual arrangement is still to be determined but there will probably be laid out a rockery, a swamp section, a small artificial brook, and a section to correspond with the ordinary upland woods. Wagon loads of leaf mould are already present, waiting for plants. A list of the species now at the Garden will be published in the next number, but it will be safe in the meantime to send in any kinds no matter how common, for the garden should represent not only species but distribution.

R. C. B.

As reported last fall, a second Society fern garden has been begun at the Harvard Botanic Garden and a third will be started during the coming season at the Missouri Botanical Garden at St. Louis. These collections of living plants bid fair to become one of the most interesting features of the Society's work. We cannot all have fern gardens of our own; but now we can all have a place where the ferns we find—and especially the rare and interesting forms which might be lost—will be cultivated and given expert care. And all we have to do is to send them in. The Society is much indebted to the authorities of the botanic gardens concerned for their cordial co-operation.

The Secretary has only just received word of the death of two of our members during 1915—Mr. Edwin Parsons Wentworth on June 30, and Rev. Fr. Zephyrin Leonard Chandonnet in November.

Father Chandonnet was born at Pierre de Bequet, Canada, July 10, 1848. He was ordained a priest of the Roman Catholic Church in 1874 and served that church in many places, including Trinidad and the West Indies. At the time of his death he was priest of St. James's hospital at Perham, Minn. With him, botany was a cherished and zealously pursued avocation and it was "no uncommon sight to see his venerable figure in the fields and woods" about Perham. He had many botanical correspondents both in this country and abroad.

Mr. Wentworth was born at Buxton, Maine, Jan. 1, 1854, and received a high school education. For 34 years prior to 1911, he served as Assistant Superintendent and Superintendent of the Maine State School for boys. In this work he made an enviable record. He brought to it the wise and kindly spirit which endeavors to regenerate rather than merely punish offenders, and the sympathy and understanding necessary to accomplish such a result. Under him the School "changed from what was practically a prison for boys with cells, prison bars and walls, to a part of the educational system of the State of Maine."

By an exchange with Prof. Clute, the Society has acquired the volumes of the *Fern Bulletin* needed to complete its set, and also a duplicate set of vols. 7-20 inclusive. The latter will be available for loaning to members as soon as it is bound.

Mr. H. C. Bigelow writes: "I have sent in one life membership, two new members and renewals of seven old subscriptions." Can any other member beat that record of work for the Society? Won't some one try?

New members—

Cooper, Mrs. James E., 115 Vine St., New Britain, Conn.
Cordley, Mrs. H. G., 79 Ridgewood Ave., Glen Ridge, N. J.
Heatley, Miss Margaret, 23 Howe St., Wellesley, Mass.
Lombard, Dr. Robert H., Geophysical Laboratory, Washington, D. C.
Rooney, Mrs. Anna K., 368 Lafayette Ave., Brooklyn, N. Y.
Sloper, Harold T., 36 Russell St., New Britain, Conn.

Changes of address—

Benedict, Dr. R. C., 322 East 19th St., Brooklyn, N. Y.
Moxley, Rev. G. L., 444 South Spring St., Los Angeles, Cal.
Rossberg, William B., 44 Hawkins St., New Britain, Conn.
Stolz, Rev. J. H., 4835 Longley Ave., Chicago, Ill.

The address of Miss Ada Tobitt should be Darling, Delaware Co., Pa., not Darling Co., as printed by mistake in the list of members.

President Bissell has appointed the following committee to nominate officers for 1917: R. A. Ware, Chairman, 246 Devonshire St., Boston, Mass.; Rev. J. A. Bates; and E. J. Winslow. Members are reminded that under the present constitution any nomination proposed by three members in good sranding and sent to the chairman of the above committee before Aug. 20th, will be placed on the official ballot.

Prof. Frank T. McFarland of State University of Kentucky, Lexington, Ky., is undertaking a special study with a view to a revision of the Botrychia. He desires specimens both fresh and dried from all parts of the United States. Material will be returned if the sender expresses a desire to have it again; otherwise it will be divided equally between the American Fern Society Herbarium and the University of Kentucky Herbarium.

For sale—FERN JOURNAL, complete, 5 vols.; 12 vols. and four extra numbers of the Fern Bulletin; and 30 or 40 botanical pamphlets—12 dollars. Rev. James A. Bates, South Royalston, Mass.—Advt.

American Fern Journal

Vol. 6 JULY-SEPTEMBER, 1916 No. 3

Notes on American Ferns: X[1]

WILLIAM R. MAXON

BLECHNUM OCCIDENTALE, AN ADDITION TO THE UNITED STATES FLORA.—*Blechnum occidentale* L., an extremely common fern of tropical America at low altitudes, may be reported from the United States for the first time on the basis of a specimen recently received at the National Herbarium (No. 865605), collected near Brooksville, Hernando County, Florida, February 11, 1916, by Mr. J. B. Norton of the Bureau of Plant Industry, U. S. Department of Agriculture. The specimen (No. 437 of Mr. Norton's series) grew with others at the edge of a stream in deciduous woods, in high hammock land. Brooksville is situated in western middle Florida, 40 miles almost due north of Tampa. The region is one in which *Blechnum occidentale* might reasonably be expected to occur naturally, and there is no reason to suppose that it is not native where discovered, notwithstanding that a Plant Introduction Garden of the Bureau of Plant Industry is located not many miles distant.

At the writer's request Mr. Norton has kindly submitted the following notes relating to the discovery of this species:

"When at Brooksville, Florida, in February, 1916, as I was being driven out to the Plant Introduction Garden

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[1] Published by permission of the Secretary of the Smithsonian Institution.

[Vol. 6, No. 2 of the JOURNAL (pages 33-64, plate 4) was issued June 15, 1916.]

the first day, I noticed near the road a small stream meandering through the low virgin forest which still occupies some of this region. The stream had steep banks, much like those of a drainage ditch, where it had cut through the hard clay subsoil for about 6 or 8 feet. Growing just about the dividing line between the sandy soil and the clay subsoil were these ferns that I have numbered 436[1] and 437. On February 11th I made a trip back to this stream to get these specimens and was surprised to find two species occupying the same habitat. I did not find either one on the level of the woodland nearby, where *Asplenium platyneuron* was growing abundantly. I saw one other brook of this type in the region, but unfortunately the woodland around it had been cleared away and the ferns that had been there recently had disappeared.

"The woodland where these ferns grew is about 300 feet above sea level and about 50 feet below the crest of the high hammock which runs through this part of Florida. Their plant associates were those normal to the hardwood forest of this region, namely, live-oaks, persimmon, *Crataegus*, *Smilax*, *Tilia*, *Vitis*, *Tillandsia*, *Habenaria*, and *Epidendrum*. While there are introduced plants in this region, they are either weeds or weed-like flowering plants that have escaped from gardens around Brooksville. There is absolutely nothing to suggest that either of these ferns (*Blechnum occidentale* and *Polypodium pectinatum*) has been brought to this region."

The probability that *B. occidentale* would be discovered at some point of the Gulf Coast region had previously been pointed out.[2]

RANGE OF WOODWARDIA SPINULOSA MART. & GAL.—This species, which has been known in the United States hitherto from Arizona, California, Oregon, and Washington, has been collected in Nevada by Mr. E. A. Goldman, of the Bureau of the Biological Survey, U. S. Department of Agriculture, the specimen (No. 2441) being from Charleston, altitude 4000 feet, November 18, 1914 (National Herbarium No. 664606). Charleston is in the extreme northeastern part of Nevada, only 10 or 15 miles from the Idaho boundary. The known range is thus widely extended.

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[1] No. 436 is *Polypodium pectinatum* L.

[2] Amer. Fern Journ. 4: 16. 1914.

The British Columbia range of *Woodwardia spinulosa* apparently rests on two records. The first relates to specimens listed by Macoun[1] as *W. radicans* var. *americana*, from Texada Island, Gulf of Georgia (east of Vancouver Island), collected by Anderson in August, 1897, the record being then a new one for Canada. The second has to do with specimens in cultivation at Kew "from a small island off Vancouver Island," which were described by Wright[2] as a new species, *Woodwardia paradoxa*. Neither material has been seen by the writer, but there can be small doubt that both represent the common *W. spinulosa* of the west coast of the United States. The distinctive characters of this fern in comparison with the Old World *W. radicans* have been pointed out by several American writers, most recently by Underwood[3] in a forceful criticism of certain taxonomic practices abroad.

THE STATUS OF PELLAEA RAFAELENSIS.—In a recent number of this JOURNAL[4] Mr. George L. Moxley proposed a new species, *Pellaea rafaelensis*, the type and sole specimen known being of his own collection (No. 214), from Scholl's Canyon, San Rafael Hills, Los Angeles County, California, May 30, 1914. The plant was illustrated and was compared briefly with *P. andro-*

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[1] Ottawa Naturalist, **13**: 169. 1899.

[2] Gardn. Chron. III. **41**: 98. 1907.

[3] Torreya, **7**: 73–76. 1907.

[4] **5**: 107, 108, *pl.* 8. 1915.

medaefolia (Kaulf.) Fée, its supposed nearest ally. From description and illustration the material appeared to the writer as probably no more than a luxuriant form of *P. andromedaefolia*, and a critical examination of the type, courteously lent by Mr. Moxley, has confirmed this view. The extent of variation within *P. andromedaefolia* is extremely great, even in a limited series of specimens, the differences seemingly dependent on conditions of moisture supply and insolation. The present specimen is exactly matched by other material in the National Herbarium from neighboring parts of southern California and is connected by numerous intermediate specimens with the commoner, more congested forms having smaller segments.

WASHINGTON, D. C.

The Fern Grottoes of Citrus County, Florida

ROLAND M. HARPER

In the extreme southeastern part of Citrus County, Florida, on the border between the lime-sink and Gulf hammock regions,[1] in about latitude 28° 40′, are some limestone cliffs, chasms and grottoes, notable for their rare ferns, some of which are tropical species which do not range much farther north, and some are confined to Florida. Before describing the place it will be in order to sketch the history of its exploration by botanists, as far as known.

The first botanist to visit the locality seems to have been A. H. Curtiss, in April, 1881, which was a year or two after the publication of D. C. Eaton's Ferns of North America. Just what clue brought him there is not known; there were no railroads in the neighborhood at the time, and he drove through the country from Gainesville, about 75 miles away. The ferns he distributed from there (using the names printed on his labels) were *Asplenium firmum* (No. 3723*), *A. myriophyllum* (No. 3728), and *Aspidium trifoliatum* (No. 3752*), the last being new to the known flora of the United States. (These asterisks are not footnote references, but part of Mr. Curtiss's system of numbering.) They are labeled "Limestone rocks in a forest at the head of Lake Tsala Apopka, Western Florida. April." As he was then making 125 sets of specimens, they are doubtless to be seen in all the principal herbaria of the world. In the Bulletin of the Torrey Botanical Club (**8**: 99–100) for September, 1881, D. C. Eaton reported the finding by Curtiss of *Aspidium trifoliatum* "on a rocky hummock[1] in Hernando County [Florida] in the middle of April last." In the supplement of the second edition of Chapman's Flora of the Southern United States, 1883, page 671, the same discovery is recorded.

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[1] For map showing location of these regions see 3d Ann. Rep. Fla. Geol. Surv., pl. 16.

On March 22, 1883, Capt. John Donnell Smith visited the same place or one very near it, and got a few species of ferns that Curtiss overlooked or at least did not collect. His finding of *Phegopteris reptans*, *Adiantum tenerum*, *Asplenium firmum*, *A. rhizophyllum*, and *Aspidium trifoliatum* "on the face of cavernous calcareous rocks in a hammock on the left bank of the Withlacoochee River, 15 miles from Brookesville, Hernando Co., Florida," was reported by Prof. Eaton in the Torrey Bulletin for September, 1883.

In 1887 Citrus County was formed from the northern part of Hernando, and about the same time a railroad was built to Brooksville, crossing the Withlacoochee

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[1] Mr. Curtiss probably wrote "in a hammock," but hammock was confused with hummock by northern writers through most of the 19th century. See Science II. **22**: 400–402. Sept. 29, 1905. The locality was then in Hernando County, and Citrus County did not exist.

River at Pemberton's Ferry (afterwards Fitzgerald, now Croom), about eight miles above the fern locality. On February 12, 1891, Prof. L. M. Underwood, taking advantage of this railroad, visited the spot, and collected specimens labeled *Pteris Cretica, Asplenium firmum, A. rhizophyllum* and var. *myriophyllum, Polypodium pectinatum, Phegopteris reptans, Adiantum tenerum,* and *Aspidium trifoliatum.* Some of them are labeled "Istachatta," and some "Rocks, banks of Withlacoochee River 2½ miles below Istachatta." In the Proceedings of the Indiana Academy of Science for that year (pp. 86–87) he published the following observations:

> "A still more interesting locality for the rock ferns is on the Withlacoochee River, two and a half miles below Istachatta. This town, which makes considerable display on the maps, consists of two houses and a store and must be reached from Pemberton, the nearest railroad station by boat or private conveyance. As the exact locality has never been defined it was by merest chance that we met Mr. F. M. Townsend, the proprietor of the store in Istachatta, who conducted Donnell Smith to the same location in 1883. The locality . . . . was reached just at nightfall. Here, besides a much greater profusion of the species found at Ocala, are found the rare and variable *Phegopteris reptans* and a great profusion of *Aspidium trifoliatum.* Other stations are found near Brooksville and farther down the river on either side. In these sheltered sink holes, protected from frost and so far removed from sunshine as to retain moisture in the driest season, these relics of a tropical flora still persist, never attracting the attention of either the native 'cracker' or the northern migrant, both of whom stare alike at the botanist and his outfit and doubtless wonder what he can want of 'fearns'."

Shortly after that a railroad was built north and south through Citrus County, to serve the recently discovered phosphate mines, and passed within a mile or two of the fern grottoes. W. T. Swingle passed that way in 1894, and in the Columbia University herbarium there is a specimen labeled *Asplenium myriophyllum* from

"Limestone rocks at Istachatta," collected by him July 24, 1894, and distributed by Mr. Nash as his No. 1396a. In the summer of 1898 Prof. A. S. Hitchcock walked along the railroads of Florida from Monticello to Brooksville, thus passing very near the fern wonderland, but apparently without being aware of it. Soon afterward he published a list of Florida plants, based on his own collections and those of Curtiss and several others, and in this (Trans. Kan. Acad. Sci. **17:** 96–97. 1901) nine species of ferns, including all those previously mentioned, are reported as having been collected at "Lake Tsala Apopka" or "Istachatta," by Curtiss.

Going back a little in our narrative, Mr. Curtiss was there again on August 18, 20 and 23, 1897, and collected in "Rocky woods near Istachatta" the following ferns using his names and numbers): *Adiantum tenerum* (5961), *Asplenium firmum* (5962), *A. myriophyllum* (5963), *Aspidium trifoliatum* (5964), *Phegopteris reptans* (5965), *Asplenium parvulum* (5966), and *Pteris Cretica* (5967).

In the Plant World (**5:** 68–70) for April, 1902 (published the latter part of May), Mr. Curtiss published a description of the locality, or localities, in question, which is so interesting that part of it will be quoted here, notwithstanding that the original is still comparatively accessible. He says:

> "It was early in April, 1881. On the morning of the day before, at Gainesville, I had dropped a $20 gold piece into a liveryman's hand for a four days' ride in a wagon with two horses and a negro driver. . . . Near noon of the second day, we came to a dense forest with wild orange trees on its border. On entering the forest it seemed as if I had suddenly entered another world, so different was it from anything I had seen in this state of terribly monotonous and tame scenery. My attention was first attracted to two skulls of cattle sticking in the narrow mouth of a chasm. The animals had evidently slipped in from an overhanging bank and been held by the horns till their bodies dropped off. Advancing into the dark

forest I found the surface to be rugged beyond anything I ever saw in mountain regions, being a succession of cliffs, pits, chasms and rocks of all sizes and forms, the whole being covered with spongy mold. And there was such a wonderful variety and profusion of beautiful West Indian ferns that after my first sensation of delight, I felt appalled at the idea of collecting so many sets, and I was then making 125 specimens of a kind. What gave me the most trouble, as well as pleasure, was the splendid *Aspidium trifoliatum*, then for the first time found in the United States.

"The fern hammock, as I call it (the word hammock being a southern substitute for forest, erroneously compounded with hummock by lexicographers) I reached by riding about two miles northward [from Istachatta] and then walking about one mile through fields. The ferns most abundant are *Asplenium myriophyllum*, *A. firmum* and *A. parvulum*, *Pteris cretica*, *Adiantum tenerum*, *Aspidium patens* and *A. trifoliatum*. On my first visit, when I struck another part of the hammock, I collected *Polypodium pectinatum*, and on my last I found *Phegopteris reptans* (a 'walking leaf') in one spot. I never went far into the hammock, being prevented either by lack of time or bad weather [doubtless referring to the heavy rains of summer]. It would be imprudent to explore this hammock alone. The last day I was there a slender sapling was all that saved me from falling backward from a ledge of rock over a sharp rock below. A day or two later a prominent citizen while hunting in the same hammock had his back broken and died after thirty-six hours of intense suffering. . . .

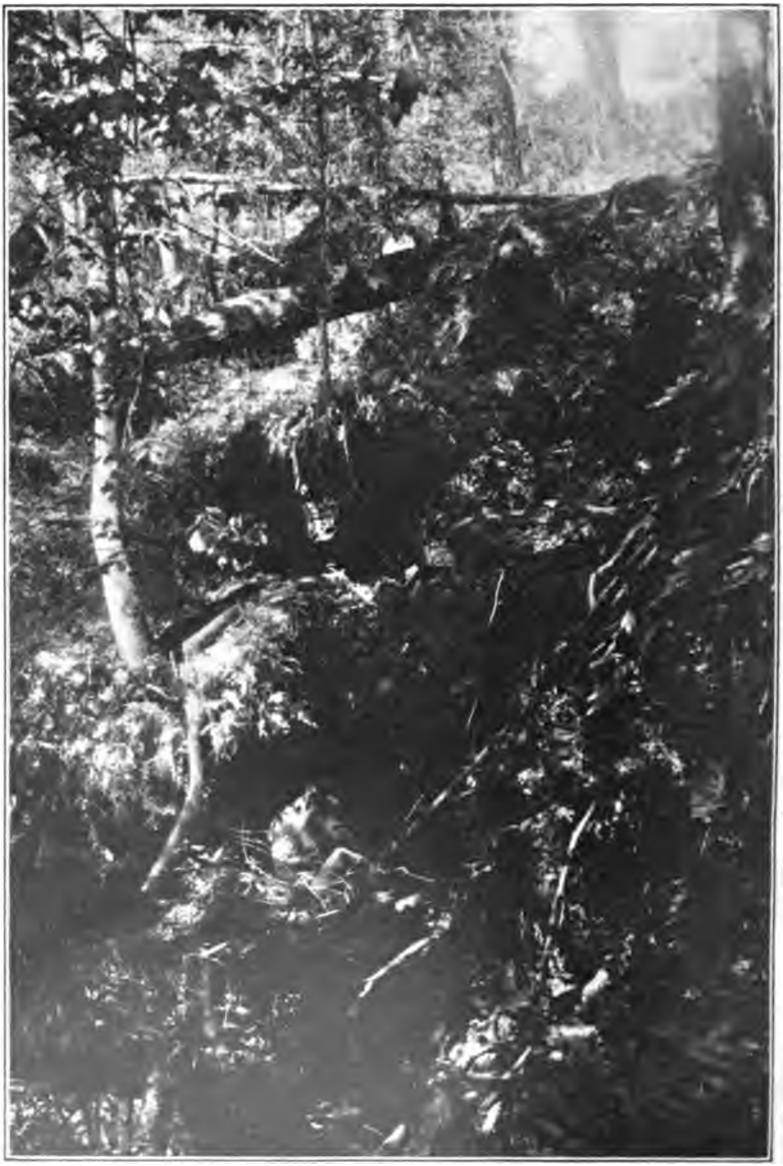
"Of the exquisite *Asplenium myriophyllum* there are two marked forms in this locality, and I have given both of them wide distribution. It seems that they differ only in size, but there is no apparent reason why one grows so much larger than the other."

In 1906 Prof. Underwood (Bull. Torrey Club **33:** 193-195) pointed out that these two supposed forms of *Asplenium myriophyllum* were specifically distinct from that West Indian species and from each other, and gave them new names. He also revised the nomenclature of one or two of the other ferns from the same place.

About 1908 Mrs. Mary A. Noble, an enthusiastic fern student living at Inverness, the county-seat of Citrus County, heard of this fern locality independently, and visited it, as well as a somewhat similar place a few miles farther north, known as Britton's Caves. She writes me that the neighborhood used to be infested with "moonshiners," and an innocent stranger was once killed near there on suspicion of being a revenue officer. In January, 1909, I walked from Croom to Istachatta one afternoon, and asked one of the old residents of the latter place for information about the fern grottoes. He told me how to get there, but warned me of the danger of getting lost. For that reason, and also because of the lateness of the hour, I did not attempt to go to the spot then; and over six years elapsed before the opportunity came for some one to accompany me there.

In the fall of 1913 the U. S. Bureau of Soils published a soil survey of the "Ocala area," corresponding with four topographic maps of the U. S. Geological Survey published about 18 years before. The southern boundary of this survey is lat. 28° 45′, a little north of Floral City. The soil survey of Hernando County, published in 1915, stops at the county line just north of Istachatta. All the fern grottoes, as far as known, are in the space of six miles between the two surveys, and are thus not yet represented on either topographic or soil maps. There seems to be absolutely no mention of them in geological literature, and apparently no geologist had ever seen them until the time mentioned in the next paragraph.

On the morning of March 6, 1915, accompanied by the state geologist of Florida and his chief assistant, I left the southbound train at Istachatta, which is in the northeastern corner of Hernando County. New directions for reaching the fern place were easily obtained, and we walked north along the railroad about two miles, to a flag-station called Pineola, then east about a mile into the woods, which brought us nearly to the Withlacoochee River, opposite Bay Hill, Sumter



Limestone cliffs in the fern hammock near Pineola, covered with mosses and ferns. Pool of water in left foreground.

County. After leaving the open pine woods which characterize most of the lime-sink region we traversed first a sandy hammock full of saw-palmetto, which did not look very promising for ferns; but just as we were about to conclude that we were on the wrong trail a few limestone rocks appeared, the saw-palmetto was left behind, and we were soon at the desired spot.

It is difficult to describe the place satisfactorily. All the rock we saw was on two or three acres, at the edge of the river-swamp. It is a soft limestone, presumably of the Vicksburg formation (Upper Eocene or Lower Oligocene, practically the oldest formation exposed in Florida), and has been dissected by the processes of weathering into rugged cliffs and chasms, the highest being perhaps ten feet above the water. Some rocks tumbling against one another as they were undermined by solution formed natural bridges, and there were also a few small caves. At the time of our visit the river was higher than usual, and backed up among the rocks, preventing exploration of any of the caves.

The rocks were overgrown with a forest composed mostly of deciduous trees, such as *Carpinus*, *Quercus Michauxii*, *Q. Schneckii*, *Ulmus Floridana*, *Celtis*, *Morus rubra*, *Liquidambar*, *Negundo*, and *Cornus florida*, with *Taxodium distichum* and *Acer rubrum* in the wet hollows, the whole making a dense shade eight or nine months of the year. (They were already pretty well leafed out when we were there, the first week in March.) There were also two species of evergreen trees, *Quercus Virginiana* and *Persea Borbonia*, and some grape vines and other vines, but hardly any shrubs. The accompanying illustration will give some idea of the aspect of the place, though the photograph was made under unfavorable conditions,with the bright sunlight coming through the forest canopy in spots.

Ferns of all the species previously mentioned, as well as one or two others, were found growing all over the vertical faces of the cliffs, together with *Thuidium* and other mosses. Whether the profusion of ferns was due primarily to the limestone, or to the shade and humus, the protection from wind and extremes of heat and cold, or the exemption from fire[1] afforded by the river-swamp, the rough topography, and the damp humus, is still an open question. Weather stations in the vicinity report some frost every winter, but the interior of the forest is of course better protected. I was not equipped for collecting specimens, not expecting to get back to headquarters for ten days or so, but my companions sent living material of some of the prettiest ferns by express to their homes in Tallahassee, and some of them were still growing when I left Florida in the fall.

We soon located the probable spot where "a slender sapling" saved Mr. Curtiss from serious injury, the sapling of 1897 being in 1915 a box-elder tree about eight inches in diameter. During the few hours we were there I met with an accident a little different from any described by previous explorers, but due in all probability to the same cause as most of them, namely, the softness of the limestone. I had stepped out on a projecting ledge to reach for the branches of a tree, when without warning a piece of rock weighing perhaps 200 pounds broke off under my weight and precipitated me into a pool of water six or eight feet below. Fortunately the water was only about a foot deep, I kept my balance (and did not even get my camera wet), and the rock did not roll over on me (as may have happened to the prominent citizen mentioned by Curtiss), so that no damage was done.

The latest contribution to the literature about this place is a short article by Mrs. Noble on "Fern hunting in the phosphate country," in the June number of this journal. (Her quoted definition of hammock on page 43 is spoiled by the accidental omission of nearly a line. The original of the quotation is in a footnote on page 217 of the third annual report of the Florida Geological Survey.)

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[1] The only ferns known to the writer which grow in places frequently burned over are the species of *Osmunda*, *Anchistea* and *Pteridium*.

The following is an annotated list of the ferns of this locality, with the names brought as nearly as possible up to date. The identity of some of them has long been in doubt, and the names of most of them have been changed in recent years perhaps because fern taxonomists having comparatively few species to work with must keep revising them in order to keep busy), which seems unfortunate to an "outsider" who is not specially interested in ferns. I am indebted to Miss Margaret Slosson for assistance in straightening out some of the names.

POLYPODIUM PLUMULA HBK.

Mostly on bases of trees, not abundant. Fern students have long had trouble in distinguishing this from *P. pectinatum* L. Both species are reported from several other places in peninsular Florida and tropical America.

POLYPODIUM POLYPODIOIDES (L.) A. S. Hitchcock.

On trees. Widely distributed in the southeastern United States and tropical America.

PTERIS CRETICA L.?

On rocks. There has been much confusion between this and *P. multifida* Poir. (*P. serrulata* of many authors; see Underwood, Torreya **7**: 196. Oct. 1907) and both have been suspected of being mere escapes from cultivation.[1] But it is inconceivable that an exotic plant could have become established at this locality at a time when there were no railroads or settlements near. It is widely but sporadically distributed, sometimes in artificial habitats, in the southeastern states and other warm countries.

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[1] See Fern Bull. **13**: 9. 1905.

ADIANTUM TENERUM Sw.

On rocks. The pinnae of this species are usually described as deciduous, giving the impression that they do not remain green through the winter, as do those of the related *A. Capillus-Veneris.* But it seemed perfectly evergreen at this time and place. However, it happens that the next day I visited the "Devil's Punchbowl" near Brooksville, which is reputed to be a great place for maidenhair ferns, without seeing anything of the kind; so perhaps the pinnae do not always persist until the new fronds appear in spring.

ASPLENIUM HETEROCHROUM Kunze. (*A. muticum* Gilbert.[1])

On rocks. Florida, Cuba, and Bermuda. Very similar to *A. resiliens* Kunze (*A. parvulum* Mart. & Gal.), which has a similar habitat but much wider range.

ASPLENIUM ABSCISSUM Willd. (*A. firmum* Kunze. See Underwood, Torreya **7**: 198. Oct. 1907.)

Common on rocks. Also near Ocala, and elsewhere in peninsular Florida and tropical America.

ASPLENIUM VERECUNDUM (Chapm.) Underwood, Bull. Torrey Club **33**: 193. 1906.

Common on rocks. Reported also from Jackson, Marion and Dade Counties.

ASPLENIUM CURTISSII Underwood, Bull. Torrey Club **33**: 194. 1906.

On rocks. Known otherwise only from the vicinity of Ocala, Marion County. This and the preceding were formerly referred to the West Indian *A. myriophyllum* and A. *rhizophyllum.*

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[1] See Maxon, Contr. U. S. Nat. Herb. **17**: 140. 1913.

TECTARIA HERACLEIFOLIA (Willd.) Underwood, Bull. Torrey Club **33:** 200. 1906.

Rather common on rocks, and conspicuous on account of its coarse fronds. Known also from Dade County, western Texas, and the West Indies. Formerly confused with the West Indian *T. trifoliata* (*Aspidium trifoliatum* (L.) Sw.

DRYOPTERIS NORMALIS Christensen.

Common on rocks. Widely distributed on Eocene and later limestones from Georgia to California and the West Indies. Until recently referred to *D. patens* (Sw.) Kuntze. No specimens from Citrus County seem to be in the New York collections, probably because collectors did not want to bother with such a common species.

DRYOPTERIS FLORIDANA (Hook.) Kuntze.

In rich humus. Widely distributed in the coastal plain of Georgia, Florida and Alabama. No specimens, probably for the same reason as in the last case.

DRYOPTERIS RADICANS (L.) Maxon, Contr. U. S. Nat. Herb. **10:** 490. 1908. (*Goniopteris reptans* (Gmel.) Presl; *Phegopteris reptans* D. C. Eaton.)

On rocks; one of the rarer species. Known from a few other localities in peninsular Florida, and in the West Indies.

A dozen species of ferns on a single acre is rather unusual in the United States, but by no means unprecedented. (See notes on the ferns of Scolopendrium Lake by Prof. Underwood in the Fern Bulletin for October, 1897.)

Now for what may be the last chapter in the history of the beautiful fern grottoes; and a rather sad one it is. In July, 1915, there appeared in several Florida newspapers an account of a wonderful cave that had been discovered in opening up a new rock quarry in Citrus County, midway between Floral City and Istachatta. The item in the Citrus County Chronicle (published at Inverness), after describing the stalactites, fossils, etc., but saying nothing about ferns, closed with the remark that the proprietor was "loath to desecrate this bit of underground wonderland, but being of a frugal [or rather avaricious?] nature the prospects for turning it into some of the coin of the realm will probably prevail over his regard for it as a geological asset. And there will probably be no dissenters in these parts, for it has incurred great expense to equip the plant."

I was in the West at the time, but on returning to Florida early in October I wrote to Mrs. Noble and asked her if that meant the destruction of our fern locality near Pineola; and she replied that she thought it did, and "*sic transit gloria mundi.*" But noticing that the item stated that the quarry property was midway between Floral City and Istachatta and embraced 26 acres of rock (while Pineola is about 5 miles from Floral City and 2 from Istachatta, and has much less rock than that), I wrote again to Mrs. Noble and urged her to investigate further. She kindly did so, and wrote me on Nov. 22 that the locality had not yet been disturbed, but the presence of some surveyors' stakes and prospectors' tools made the outlook rather discouraging. In a later letter she mentioned that the rights to all the limestone rock in the neighborhood had been purchased for $60,000.

I also advised her to write for the Chronicle a protest against the proposed devastation of that interesting locality, and try to bring the matter to the attention of the State Federation of Women's Clubs, who have recently acquired control of Paradise Key or Royal Palm Hammock at the south end of the Everglades, for the purpose of preserving it in a more or less natural condition.[1] She did write such an article, but it was mislaid in the printing office and never published; so the destruction is probably still going on unheeded. The locality here described, on account of the limited amount of rock above water-level, may be spared until the deposit a little farther north is exhausted; but it seems to be threatened with the same fate that overtook one of the hart's-tongue fern localities near Syracuse, N. Y.,[2] and the only Mississippi station for *Trichomanes Petersii.*[3] Any fern student who visits Florida in the near future, therefore, should make it a point to see the Pineola grottoes before it is too late, but bearing in mind the various perils above mentioned. There are no hotel accommodations near, but the place can easily be explored between the morning and afternoon trains in either direction. Possibly other equally interesting spots could be discovered near by, too.

COLLEGE POINT, N. Y.

An Adirondack Fern List

R. C. BENEDICT

The section of the Adirondacks with which I am familiar is notable for the large number of fern plants but the very small number of fern species. The Syracuse field meeting of the Society in July, 1915, resulted in the collection of forty different ferns, excluding lycopods, equisets, and varieties. With two or three days' further exploration it would have been possible to find within the confines of Onondaga County nearly if not quite ten more kinds, making a total of fifty, a number practically double that of many states.

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[1] See Small, Jour. N. Y. Bot. Gard. **17**: 41. March, 1916.

[2] See Maxon, Fernwort Papers 31. 1900.

[3] See Underwood, Torreya **3**: 18. Feb. 1903; Fern Bull. **13**: 6. 1905. Nothing is said there about the destruction of the locality, but Prof. Tracy told me in 1905 that the rock (presumably Altamaha Grit) had been blasted away for railroad ballast.

In the course of several summers spent in the Adirondacks in the neighborhood of the Fulton Chain of Lakes, Herkimer and Hamilton Counties, I have a record of twenty species which is given below. This, of course, is not a complete list even for the region in question, as fern-hunting as a sport in competition with swimming, tramping, canoeing, fishing, etc., did not by any means come off first in my case, but there were some very interesting points noted in connection with the species found, and it would certainly be of interest to have observations from others who have collected in the Adirondacks, both to add to the list and with regard to other peculiarities noted. Especially if some one has already published an account of Adirondack ferns I would be glad to know of it.

The region covered by the list is practically entirely woods and water. The altitude varies from about seventeen hundred to thirty-eight hundred feet. Practically all that is not hill or mountain is swamp or lake. I have been along the shores of twenty lakes and have seen probably twice as many more from elevations. Swamps are frequent with sphagnum in most of them. The swamps are usually covered with larch, spruce, balsam, and alder, while the slopes show beech, yellow birch, hard maple, and moose wood, mountain ash, with some pine and hemlock. The rock is all granitic. Fallen logs and large boulders are everywhere.

The list follows:

Osmunda cinnamomea, O. Claytoniana, O. regalis. The first grows in the swamps, the second on moist slopes, and third along streams and sometimes on the lake shores themselves. Long Lake is lined in its rocky portions with royal fern which shows some beautiful color variations in September. Two cinnamon fern plants were seen with marked forking of the leaves and one of these was sent to the Society garden at the Brooklyn Botanic Garden.

Athyrium acrostichoides, *A. filix-femina*. The latter is common, the former not very.

Dennstaedtia punctilobula. Frequent, at its best in open sunny places, but common in shades from swamps to mountain tops.

Dryopteris cristata, *D. cristata* × *intermedia*, *D. cristata* × *spinulosa*, *D. dilatata*, *D. dryopteris*, *D. intermedia*, *D. noveboracensis*, *D. phegopteris*, *D. simulata*, *D. spinulosa*, and *D. thelypteris*. The most interesting thing about this list to me is the absence of *D. marginalis*, the commonest fern in the central New York woods. Is it common anywhere in the Adirondacks? Do the high altitude and long winters exclude it? As a matter of fact the winters though long and cold are not hard on herbaceous plants because there is such a deep snow blanket that the ground freezes very little.

D. simulata I reported some six years ago in Torreya as from the north side of Quiver Pond, a small lake near Fourth Lake. This summer I found it in much greater quantities along a little trickle which made its way under the logs of an old abandoned corduroy road formerly used in lumbering operations. The locality is near Third Lake Creek and south of Quiver Pond. The little stream followed the corduroy road for a quarter of a mile and everywhere the *simulata* was abundant. Sphagnum is scattered everywhere, and its concomitant moisture. Has anyone ever found this fern in anything but boggy or sedgy situations?

D. dilatata was found only once on Blue Mountain, from three thousand feet to the top about thirty-eight hundred feet high. I have never found it at lower elevations in the Adirondacks. The mountains whose tops range about twenty-five hundred feet do not seem to furnish the right conditions for it. That it may occur at lower elevations is undoubted, but I believe that it will be found that local conditions, such as may be found in a very deep cool ravine, for example, would account for its being lower. A correspondent in Europe once wrote me that in central Europe it is also confined to comparatively high altitudes. In more northern latitudes as in Labrador it is, of course, found even as low as at sea level, but this is also true of most alpine plants.

The special point in mind is the mistake often made, as I did for years, of trying to find *dilatata* in every broad leaved *intermedia* in any lowland woods. When once seen it is recognized as a very distinct thing and even when transplanted to lower levels it retains its distinctive characters. I brought Blue Mountain plants of *dilatata* to the New York Botanical Garden in 1908 which are still growing there and easily distinguishable. Then, too, *dilatata* is the first of the spinulose ferns to feel the effects of frost which causes the leaves to wither and turn brown in September.

Onoclea sensibilis. Common along Third Lake Creek, but becoming less so as the operations of beavers are continually raising the level of more and more of this stream and the sensitive fern or, as Mr. Scott calls it, the bull-moose fern, usually occupies stretches of grassy bank. I remember seeing one considerable growth of *Onoclea* almost entirely covered with water due to a recent addition to the height of the next dam below. After a short period of this treatment even the bull-moose fern succumbs. Some of the beaver dams are so extensive and so placed that large tracts of land have been flooded with the consequent death of many acres of trees. The beavers were introduced by the state some years ago and are still protected by penalty of a heavy fine.

Polypodium vulgare. Almost every large boulder in moist upland woods is covered by large sods of polypody, locally called rock fern. Considerable fruitless search was made among such colonies for marked variations in leaf form.

Polystichum acrostichoides. Comparatively infrequent. Many of the wooded slopes are apparently too damp for it.

Pteridium aquilinum. Abundant on cleared neglected banks or competing with berry bushes.

BROOKLYN, N. Y.

The Ferns of the Lake George Flora, New York

I.

STEWART H. BURNHAM

The region covered by the so-called Lake George Flora includes the counties of Washington, Warren and Saratoga. Three additional records in the counties of Essex and Hamilton are also given. The altitude at Waterford and for some distance up the Hudson river is but 100 feet above the sea; also South Bay and lower Lake Champlain is 101 feet. Black Mt. on Lake George, 2665 feet, is the highest land in Washington county. Crane Mt., 3254 feet, and Gore Mt., 3595 feet, are well known peaks in Warren county. Several other peaks in northwestern Warren county are over 3000 feet; but Gore Mt. is the highest land in the region.

The rocks composing the mountains are largely of a granitic gneissoid nature. Chazy limestone, appearing in the vicinity of northwest Hartford, extends through the town of Kingsbury to Glens Falls, where it is known as Trenton limestone or black marble. Slates occur along the eastern side and in southern Washington county; also along the banks of the Hudson river from Glens Falls to Waterford and along the Mohawk river. Considerable sandy soil is found in Saratoga county and a few sandy tracts in Warren and Washington counties. Clay soils occur, specially along and near the larger streams and in the Champlain valley. Much of the soil of the lowlands was deposited when the Laurentian glacier covered the region.

I began to study the ferns of this flora in 1889. Many other botanists have collected in the region, specially about Lake George. Dr. E. A. Burt collected a few ferns about East Galway, Saratoga Co., about 1880: these are preserved in his herbarium. Mr. W. N. Clute collected and observed several ferns, July, 1908, at Round Lake. Mr. and Mrs. Edward Cornell collected ferns, in 1909, near their home in Cambridge. Mr. Frank Dobbin has collected near Shushan. Mr. Wallace Greenalch, in 1900, collected ferns near Schuylerville. Dr. Chas. H. Hall collected ferns at Lake George (probably near Bolton) in 1876: these are preserved in the Herbarium of the Brooklyn Botanic Garden. Dr. Geo. D. Hulst collected at Lake George, in the vicinity of Assembly Point, from 1892 to 1900: at the time of Dr. Hulst's demise, the ferns were retained by Mrs. Hulst, although Dr. Hulst's other collections are preserved in the Herbarium of the Brooklyn Botanic Garden. A few of Dr. Hulst's ferns may be found in the N. Y. State Herbarium at Albany. Dr. Smith Ely Jelliffe collected ferns about Huletts Landing, Lake George, in 1886, and afterwards: these are preserved in his herbarium. Prof. James F. Kemp collected about Silver Bay, Lake George, in 1900 and 1902. Dr. Chas. H. Peck collected ferns in the territory; these are preserved in the N. Y. State Herbarium. Mr. Frank T. Pember has collected near Granville. Mrs. S. W. Russell collected ferns near Hillview, Lake George, in 1910. Mr. Frank G. Taylor, in 1908, collected near Easton. Mrs. E. Watrous has found interesting ferns near Hague, Lake George. Prof. C. L. Williams has collected at Lake George; and has a fern garden in Crandall park, Glens Falls.

More thorough search will undoubtedly bring to light, perhaps additional species, and many interesting forms, especially among the mountainous districts of Warren and Saratoga counties, where the flora has received but very little attention and study.

Ophioglossaceae

OPHIOGLOSSUM VULGATUM L.

Dry pastures, rarely in swales, bogs and woods; infrequent. June–August.

Glens Falls (Mrs. L. A. Millington) in correspondence with Mr. Wm. H. Leggett, June 19, 1872, says: "*Ophioglossum vulgatum*, I find in nearly every swampy bit of grass"; Assembly Point, Lake George (G. D. Hulst); Hague (Mrs. E. Watrous); Comstocks (J. F. Kemp); Granville, "rather common" (F. T. Pember); Baker farm near Schuylerville (Wallace Greenalch); New Michigan Pond marsh, W. Fort Ann, Nov. 3, 1900, two small sterile plants growing in sphagnum; southeast of Tripoli; Vaughns; bog north of Round Lake; low meadow south of Shushan near the Fly Kill.

This fern prefers to grow about little knolls of stony sandy and silt loam at Vaughns; and is usually overlooked on account of its small size. It varies from a few inches to a foot in height and has from one to three fruiting plants from the same rootstock, more than one when the plants are somewhat gregarious. Dry successive seasons tend to kill it out. It grows quite luxuriantly, between the tussocks of a swale of *Carex stricta*, about a mile east of Vaughns corners, on the north bank of South Beaver creek.

BOTRYCHIUM SIMPLEX E. Hitchcock

Dry woods; very rare.

Woods of sugar maple and hemlock, about half a mile west of Vaughns schoolhouse, June 23 and July 12, 1896 (a portion of the sterile frond fruiting in one or two specimens); June 10, 1897 (unrolling); July 11, 1899. Palmertown mountains, east of Brayton, Lake George, top of the ridge, June 16, 1897; a single plant with the sterile segment 9–lobed and long petioled. Sugar maple woods east of Tripoli schoolhouse, July 13, 1897.

Probably often overlooked because of its small size. The specimens have been verified by Miss Margaret Slosson.

BOTRYCHIUM NEGLECTUM Wood

Mixed woods of hemlock and hardwoods; and moist ravine beds in mountain woods; scarce. May 25–July 25.

Burnt Hill, Assembly Point (Hulst); Whitehall (C. H. Peck); Mt. Hope, Putnam mountains; the falls in West Brook and near Three Ponds, W. Fort Ann; Vaughns, sometimes under the deep shade of small hemlocks; north of Round Lake.

The glaucous plants vary from a few inches to a foot in height. The larger plants are quite fleshy; the sterile segment is divided into 7–11 divisions; the fertile, 2–3 pinnate and much branched.

BOTRYCHIUM OBLIQUUM Muhl.

Dry woodlands and pastures; frequent. Aug.–Nov.

Lake George (C. H. Hall); Fishbrook Pond, Lake George (S. E. Jelliffe); Silver Bay & Sabbathday Point, Lake George (Kemp); Assembly Point (Hulst); "The dwarf form of var. *obliquum* with the sterile frond about one inch broad and long and the whole plant three or four inches high was found at South Corinth." (Peck) in N. Y. State Mus. Report **32:** 54. 1879; Shushan (Frank Dobbin), also in the bog north of Clarks Pond; Warrensburg; W. Fort Ann; Vaughns; northwest Hartford; and elsewhere. The dwarf form has been found in mossy woods west of Pattens Mills church and in other low woods.

An extremely variable species as to size, and the shape and cutting of the evergreen sterile frond.

BOTRYCHIUM DISSECTUM Spreng.

Dry pastures and open woods; scarce.

Vaughns; west of Kingsbury; southern W. Fort Ann; east of Fort Ann.

Usually associated with *B. obliquum* and intermediate forms are found approaching that species. The sterile frond is laciniate or finely dissected and varies in texture, the more typical plants being quite thin.

BOTRYCHIUM MATRICARIAE (Schrank) Spreng.

"South Corinth. August." (Peck) in N. Y. State Mus. Bull. **67**: 21. 1903; Vaughns, rare.

BOTRYCHIUM SILAIFOLIUM Presl

Assembly Point (Hulst); Vaughns, Sept. 30, 1903, det. B. D. Gilbert. This fern, formerly known as *B. ternatum,* var. *intermedium,* grows with *B. obliquum:* and matures its fruit two or three weeks earlier than that species.

The large form of *B. silaifolium,* known as *B. obliquum Habereri* Gilbert, was collected in open woods at Vaughns, Sept. 30, 1903. These specimens were referred to this variety by B. D. Gilbert, who said, this was the form Prof. Eaton years ago referred to Robert Brown's *B. australe.* This large form has also been found at Silver Bay (Kemp); northwest Hartford; north of Hudson Falls; and near Fort Edward reservoir.

BOTRYCHIUM VIRGINIANUM (L.) Sw.

Moist rich woods; not uncommon. June–Aug.

A plant, at Vaughns, was collected June 17, 1904, which was 31 inches high; with the fertile part 8 inches long and the sterile segment 16 by 9 inches. The young plant begins to unroll about the middle of May.

Variable as to the size of the plants; the smaller ones approaching *B. gracile* Pursh. This fern, John Robinson tells us, "never spreads except by spores, hence is not found abundant in one locality."

HUDSON FALLS, N. Y.

(To be continued)

Notes and News

NOTES ON FERN LITERATURE

MAXON, WM. R. Contrib. U. S. Nat. Herb. **17:** I–VIII & 541–608. pl. 32–43. 23 May 1916.

In the sixth installment of his Studies of tropical American Ferns cited above, Maxon deals mainly with three groups of *Polypodium*, respectively the groups of *P. trichomanoides*, *P. furfuraceum*, and *P. squamatum*, comprising sixty-four species accepted as valid and more than twenty-five additional forms. In addition the identity of several species of *Notholaena* is also dealt with. Most of the species of *Polypodium* are small forms of the West Indies, Central and South America. The paper includes sixteen new species of *Polypodium*, and two new species in *Notholaena*.

Of particular interest are the characters used in separating the different species, and the conclusions expressed or understood, which may be drawn from the results.

Characters of the scales of the rootstocks and leaves are given more weight than characters of venation, i. e., the actual structure of the individual scale as seen through a microscope. The presence of a large number of scales, as compared with the almost complete absence of scales, is not counted as significant, provided the scales in both cases show similar cell structure. It is found, however, that two forms which in general appearance are almost exactly alike may be easily separated by a study of the scale characters.

It has been common practice to use as characters of generic rank definite variations in the venation of which *Polypodium* contains a large number. *Polypodium* has been separated into a number of genera on this very basis but Maxon reports that at least one of these kinds of variation may take place even within a single species. This is *Polypodium polypodioides*, the common gray polypody of the southern states which is also common farther south. According to Maxon, it is impossible to draw any other line of distinction between leaves of this plant with free veins and others with the characteristic areolation or net-veining of section or genus, *Goniophlebium*.

Polypodium, in the broad sense, has upwards of one thousand species, the proper separation of which into genera or subgenera is yet to be devised.

R. C. B.

Wanted for study: plants or leaves showing variation in the amount of division.

In connection with the study of *Nephrolepis* variations, I am anxious to obtain leaves illustrating similar or different types of variations among wild ferns. I should be glad to receive for the Fern Society Garden at the Brooklyn Botanic Garden plants of the Christmas fern with deeply incised or twice-divided leaves, as well as similar leaves of other species.

R. C. B.

A POOR PLACE FOR FERN LOVERS.—W. W. Rowlee, reporting on a collection of plants from southern Patagonia,* records only four ferns and one lycopod as collected there compared with one hundred and sixty-six flowering plants. Who wants to go there?

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* Bull Torrey Bot. Club 44: 305-322. June 1916.

QUESTIONS.—If "hex" means six, why is *Phegopteris hexagonoptera* so-called? It is an example of a good equilateral triangle.

What causes ferns to grow forked? If it is a freak, are some genera more liable to grow thus?

LILLIAN A. COLE.

ANSWERS.—The original description of *Phegopteris hexagonoptera* gives the reason for the name, in this phrase: "membranis pinnas oppositas connectentibus oblongo-hexagonis."[1] That is, the name refers not to the outline of the frond (which Michaux notes as "almost an equilateral triangle"), but to the shape of the dilated lower portions of the pinnae which are adnate to the rachis and form wings along it.

C. A. W.

Orthogenesis (a kind of evolution), that is, an innate tendency to vary along that line. That is as much as anyone knows. All we know is that it is a common variation among ferns taken as a whole. It is commoner among certain cultivated kinds of ferns, and probably in some genera or species, *Polypodium vulgare* and *Athyrium filix-femina* for example.

Thirty years ago there were people who could have explained it much better than now. They knew why a leopard is spotted, and a tiger striped. Why? Oh, because the leopard lives under trees with spotted shade, due to their large leaves, and the tiger lives under bamboos and such like which have long leaves and so throw striped shade.

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[1] Michaux, Fl. Bor. Am. 2, 271. 1803.

About those questions of Mr. Bates in the last number, the last is the easiest to answer. The following are a few who study fossil ferns: Prof. C. E. Jeffrey, and numerous students, Messrs. F. H. Knowlton, Arthur Hollick, E. W. Berry, G. Wieland, and David White, of America; Professors Bower, Tansley, Lang, of England, not to go farther.

R. C. B.

The prize for the rarest New England fern will probably have to go to *Cheilanthes lanosa* which is known only from a single station near New Haven, Conn. *Asplenium pinnatifidum,* with two known stations, is a good second.

C. A. W.

We hope to publish very soon an article by Mr. Raynal Dodge containing reminiscences of the early New England fern students, Davenport, the two Eatons and others, and giving a particular account of the original discovery of *Dryopteris simulata* and the hybrid *Dryopteris cristata* × *marginalis.*

American Fern Society

THE SOCIETY'S FERN GARDENS

In the last number of the JOURNAL, a statement was promised of the number and names of the ferns now being grown in the fern collection of the Society at the Brooklyn Botanic Garden. Such a list follows, including all the hardy ferns now growing there, not only those sent by members of the Society but also the species which were there before the Garden was made a depository for the Society.

Look the list over. If you can add some species not now in the collection, or some interesting variety, send it in, but do not hesitate also to send in good plants of any of the kinds already there. One of the most valuable features of such a fern garden will be the association of plants of a given species from widely separated localities. At present the various kinds are represented mostly by only one or two collections.

Now is a good time to collect plants for transplanting. They should be lifted with as little disturbance as possible, the roots wrapped in moist paper or moss, and firmly tied. It is a good plan to cut back some of the leaves and is often more convenient in packing. Send by parcel post or express to the Brooklyn Botanic Garden, Washington Ave., Brooklyn, N. Y.

NATIVE SPECIES AND VARIETIES

Adiantum pedatum
Anchistea virginica
Asplenium platyneuron
  " *Trichomanes*
Athyrium acrostichoides
  " *filix-femina*
Botrychium obliquum
  " *silaifolium*
  " *virginianum*
Camptosorus rhizophyllus
Cystopteris bulbifera
  " *fragilis*
Dennstaedtia punctilobula
Dryopteris cristata
  " *cristata* × *intermedia* (*Boottii*)
  " *Dryopteris*
  " *Goldiana*
  " *hexagonoptera*
  " *intermedia*

Dryopteris intermedia × *marginalis*
“ *marginalis*
“ *noveboracensis*
“ *simulata*
“ *Thelypteris*
Lorinseria areolata
Lygodium palmatum
Onoclea sensibilis
Osmunda cinnamomea
“ *Claytoniana*
“ *regalis*
Phyllitis Scolopendrium
Polypodium vulgare
Polystichum acrostichoides
“ “ bipinnate form
“ *Braunii*
Pteretis nodulosa
Pteridium aquilinum
Woodsia ilvensis

FOREIGN SPECIES AND VARIETIES

Athyrium filix-femina Victoriae
“ “ *multifidum*
“ “ *setigerum*
“ “ *Craigi laciniatum*
“ *Goringianum pictum*
Dryopteris erythrosora
“ *dilatata*
“ *filix-mas*
“ *hirtipes*
“ “*pseudo-mas Pinderi*”
“ *propinqua*
Phyllitis Scolopendrium and horticultural varieties
Polystichum lobatum
“ “*setosum*”

Mr. Davis reports "one hundred species, representing eight genera" at the Missouri garden. A detailed report on this garden will be given later.

R. C. B.

The duplicate set of the Fern Bulletin recently acquired by the Society and comprising volumes 7 to 20 inclusive has just been bound and is now available for lending to such members as may wish to borrow it. The volumes will be sent out on the same terms as loans from the herbarium, namely, payment of postage both ways; and application should be made to the Secretary. If anyone can tell where copies of Vol. 5, no. 2, and vol. 6, no. 1, can be obtained, the Secretary would be glad to hear of it. If these two numbers can be had, volumes 5 and 6 can be added to the lending set.

More than thirty orders have been received for the sets of *Dryopteris* hybrids, the proposed issue of which was announced in the last number of the JOURNAL, and Mr. Bigelow is hard at work getting together the necessary material.

New members:

Cole, Miss Lillian A., Union, Me.
Strattan, Mrs. G. W., Buck Hill Falls, Monroe Co., Pa.
Stupp, Fred J., 94 Lake Ave., Auburn, N. Y.

Changes of address:

Farwell, O. A., 47 Smith Ave., Detroit, Mich.
Mitchell, Mrs. Mina B., Box 48, Station A, Chattanooga, Tenn.

American Fern Journal

Vol. 6 OCTOBER–DECEMBER, 1916 No. 4

The Ferns of the Lake George Flora, N. Y.

II.

STEWART H. BURNHAM

Osmundaceae

OSMUNDA REGALIS L.

This fern is frequent throughout the region in swamps, damp old fields and woods. May–Aug.

It is often found growing in shallow water about the margin of sphagnum marshes, where it attains the height of 6 feet.

OSMUNDA CINNAMOMEA L.

Low grounds and swampy woods; common. May–June.

A tall fern with a large rootstock, from which spring a circular cluster of fronds. The fertile fronds unroll in the early spring: the sterile do not attain their growth until in the summer. Sometimes confused with Clayton's Fern, when not fruiting: but the base of the stipes retain some of the ferruginous wool: and the sterile pinnae with small tufts of tomentum at their bases, are thicker, darker green, and the segments less obtuse.

The form FRONDOSA (Torr. & Gray) Britton is occasionally met with; the fronds may be sterile below or above or on one side. This fern was first noted in swamps at Cambridge in Lewis C. Beck's "Botany of the Northern and Middle States," 1st ed.: 457. Al-

[No. 3 of the JOURNAL (6: pp. 65–96, plate 5) was issued Sept. 26, 1916]

bany 1833, where it was wrongly ascribed to *O. Claytoniana*. Prof. Alphonso Wood in early editions of "A Class-Book of Botany," also describes it under the name *O. Claytoniana* and refers to the Cambridge plants: but Dr. John Torrey, in his "A Flora of the State of New York" **2**: 503. 1843, describes it as the var. *frondosa*, and says it has been found near Cambridge (Dr. M. Stevenson), as well as at Stillwater (Dr. Fitch). Dr. Stevenson's Cambridge specimens were preserved in an old collection at the N. Y. State Herbarium.

The form INCISA (Huntington) Gilbert, with the sterile pinnae more or less incised, has been found at Hampton (F. G. Taylor), Aug. 31, 1908; the woods southeast of Oneida, near Halfway brook; and east of Tripoli. At Tripoli some of the plants approached f. *bipinnatifida* Clute.

OSMUNDA CLAYTONIANA L.

Often growing with the preceding fern: and about as common. May–June.

The form DUBIA (Grout) Clute has been met with east of Tripoli. The sterile pinnae take the place of the fertile ones; on the edge of which, imperfect sporangia were visible: and the pinnae were more incised than usual.

Polypodiaceae

ONOCLEA SENSIBILIS L.

Shaded swamps, wet places and low meadows; common. July–Oct.

This fern produces two kinds of fronds; the sterile are triangular and herbaceous, quickly turning black after the first frosts. The fertile are much contracted, with berry-like segments and persist until the following spring. Specimens with the pinnae rather deeply cut were collected at Clarks Pond, west of Shushan, Sept. 21, 1907.

A form, the var. *obtusilobata* (Schkuhr) Torr., with sterile fronds, bearing a few abortive pinnae is occasionally met with, where the plants have suffered injury. "It was first detected, many years ago by Dr. Jed. Smith, in Salem." Torrey's, "Flora of the State of N. Y." **2**: 499. 1843. This fine specimen from Salem is preserved "in herb. Sartwell" at Hamilton College, according to Paine's, "Catalogue of Plants of Oneida County and Vicinity." N. Y. State Cab. Rep't **18**: 179. 1865. This form has also been found at Vaughns.

PTERETIS NODULOSA (Mx.) Nieuwl.

Wet woods, usually in alluvial soil along larger streams in thickets; infrequent. July–Oct.

Glens Falls (Hulst); Silver Bay (Kemp); Huletts Landing (Jelliffe); Hague (Mrs. E. Watrous); from French Mt., southern W. Fort Ann and South Bay southward to Round Lake, Coveville and Shushan. Along the Battenkill, near Shushan, fine plants grow; the sterile frond over 5½ feet high and the stipe covered with a bloom. This fern is not so often met with in the western part of the region.

Like the Osmundas, the numerous sterile fronds arise from stout ascending rootstocks: but the curious, dark-brown, firm, pinnate fertile fronds, do not appear until late in the season. The fertile fronds persist until the following spring. This fern was formerly known as *Matteuccia Struthiopteris* and *Onoclea Struthiopteris* of American authors.

WOODSIA ILVENSIS (L.) R. Br.

Exposed granitic rocks on mountains; local. July–Oct.

Lake George and vicinity (Mrs. Watrous) (Hulst) (Kemp) (Jelliffe); Ticonderoga, Essex county (I. Eights, in an old collection at N. Y. State herbarium); Dresden Station (Peck); rocks near South Granville (Pember); Willard Mt. (Taylor); DeRidder hill near Schuylerville (Greenalch); South Bay; French Mt.; mountains in W. Fort Ann; Peaked Rock and near Shushan.

Variable. A pretty little fern growing in dense tufts, found usually at higher elevations in the northern part of the region: but sometimes a few dwarf plants are met with in old rocky pastures, at lower altitudes.

WOODSIA OBTUSA (Spreng.) Torr.

Rocky shaded places and old pastures about limestone rocks; infrequent. July-Oct.

Bolton (Peck); Lake George (Hulst) (Kemp); rocks near South Granville (Pember); Shushan (Dobbin); Easton (Taylor); Jonesville, west of Round Lake (Hulst); French Mt.; Hague; Whitehall and South Bay, southward to Fort Ann, Peaked Mt. and Vaughns.

Distinguished from *Filix fragilis*, which it resembles, by its larger fronds, the glandular pubescent stipes and blunt pinnae, and persistent indusia. The fronds are sometimes half evergreen.

The var. ANGUSTA Pk., with narrow fronds and pinnae, has been found at Peaked Mt. and at Vaughns.

(*Woodsia glabella* R. Br. was reported as having been found near Huletts Landing, in 1892, by Madge Condit. This rare fern of the higher Adirondacks may occur on Black Mt., Lake George: but these plants were probably referable to some other fern. This fern has also been reported at Pottersville, near Schroon Lake (Mrs. E. B. Lombard): but no specimens have been seen.)

DENNSTAEDTIA PUNCTILOBULA (Mx.) Moore

Moist woods and roadsides; frequent. July–Oct.

A delicate, heavily-scented fern, more often found in newly cleared land at higher elevations. In late autumn, the fronds sometimes turn white.

FILIX BULBIFERA (L.) Underw.

Shaded cliffs and ledges, specially near limestone; frequent. July–Sept.

A handsome graceful fern, with shorter and broader sterile fronds than the long lanceolate fertile ones. The young stipes are often reddish. This fern is usually propagated by the little greenish bulblets, borne loosely on the back of the pinnules among the sori.

FILIX FRAGILIS (L.) Underw.

Shaded rocks and cliffs; common, especially near limestone. June–Aug.

Variable, and usually disappearing by September. It has been found in sandy woods, northwest of Waterford; also on earth in woods near Round Lake.

The form MAGNASORA Clute, a dry rock form, not evanescent, with large sori resembling *Polypodium*, has been found at Glens Falls. (B. D. Gilbert herb.) Fern Bull. **9**: 65. 1901.

POLYSTICHUM ACROSTICHOIDES (Mx.) Schott

Woods, rocky pastures and roadsides; abundant. Summer-autumn.

Very variable. In very dry open places, the pinnae are nearly entire. Fronds with abortive, reflexed or wrinkled pinnae are sometimes met with in woods. The fertile fronds are contracted at the apex: but occasionally sterile fronds bear sori. The young fronds of this handsome evergreen fern are erect: but become early semi-prostrate. Some plants bear fronds which do not seem as hardy as others, the fertile tip being killed by the first frosts and the frond taking on a yellowish cast. Sometimes fronds, 1–2 forked at the tip, are found: and on some fronds may be found fish-tailed pinnae.

The var. INCISUM Gray, with dark green fronds and pinnae much incised, is found in moist woods.

The form RECURVATUM Clute, with crisped bilobed pinnae was found west of Stone schoolhouse, W. Fort Ann, Nov. 23, 1900. A plant was transplanted and continued to thrive until about 1907; when it died.

POLYSTICHUM BRAUNII (Spenner) Fée

Rocky mountain woods; very rare.

Silver Bay (Kemp), Sept. 12, 1902; Hosie gulch, near Hague (Mrs. E. Watrous), June 15, 1904, and June 28 and July 16, 1907. The Hague specimens are deposited in the State Herbarium. N. Y. State Mus. Bull. **167:** 36. 1913.

A beautiful, but rare New York State fern, with chaffy stipes and rachis.

DRYOPTERIS NOVEBORACENSIS (L.) A. Gray

Moist woods; frequent. July–Sept.

The form **fragrans** (Peck), n. comb., which was later called var. *suaveolens* by D. C. Eaton; was found, near Glens Falls by Mrs. L. A. Millington, in 1875. Bull. Torr. Bot. Club **6:** 97. 1876. D. C. Eaton's, "Ferns of N. Am." **1:** 50. 1879. Dr. Peck describes it in the N. Y. State Mus. Rep't **28:** 84. 1876, as *Aspidium noveboracense*, var. *fragrans*. "Mrs. Millington observes the fronds are very tall, 'sometimes three feet high,' that the sori at length spread over the whole under surface and that there is a marked vanilla-like odor which persists even in the dried specimens."

DRYOPTERIS THELYPTERIS (L.) A. Gray

Swamps, wet woods and rocky pastures; common. The pinnae are alternate or nearly opposite.

In the woods near Excelsior Spring, Saratoga Spa, July 28, 1870, Isaac H. Hall says, "amongst a large number of plants of *Aspidium Thelypteris* Swartz, I found several with the stipe or rachis enameled, black and shiny, like that of *Adiantum pedatum* L., or of *Asplenium ebeneum* Ait. The blades of the fronds had a somewhat coppery tinge. Some were beginning to fruit, but most showed no sign of fructification. I gathered a dozen or so, but the extreme heat of the sun withered and spoiled them before I could get them in press." Bull. Torr. Bot. Club **1:** 30. Aug. 1870.

DRYOPTERIS CRISTATA (L.) A. Gray

Deep old swamps and low thickets: infrequent, but widely scattered.

DRYOPTERIS CLINTONIANA (D. C. Eaton) Dowell

In swampy woods and thickets, with the preceding; frequent. The fronds are much larger and broader than in the crested shield-fern.

The enherbaceous form, var. **Slossonae** (Dav.) n. comb., with large thin fronds, was found Aug. 24, 1900, in low woods, near Halfway brook, southeast of Oneida. Determined by Dr. Geo. E. Davenport, Dec. 30, 1900, who says, "like the enherbaceous form of *Clintonianum* from Vermont that I have been investigating for some time back." This is probably where Dr. Hulst collected the same form in 1900. Dr. Davenport describes this form as *Nephrodium cristatum* Rich., var. *Slossonae* in Rhodora **4:** 52. March, 1902.

DRYOPTERIS GOLDIANA (Hook.) A. Gray

Damp rich old woods; scarce.

North of Silver Bay (Kemp); Hosie gulch, Hague (Mrs. E. Watrous); Huletts Landing (Jelliffe); Round Lake (W. N. Clute); Easton (Taylor); Inman Pond, north of Lake Pond and Mt. Hope, W. Fort Ann; northwest Hartford; Devines woods and a few plants in the woods southeast of Vaughns schoolhouse; a few plants, west of Tripoli schoolhouse; north of Hudson Falls, near the King cemetery.

DRYOPTERIS MARGINALIS (L.) A. Gray

Rocky woods and shaded banks; abundant.

The fronds of this beautiful species are evergreen. The plants vary in size and incising of the pinnae. Dwarf fruiting plants, 7 to 11 inches high, are sometimes found on dry rocks.

A form, known as var. *elegans* (John Robins.) Carhart is sometimes met with in rich moist woods. The fronds are very large: and the segments of the pinnae lobed or pinnatifid.

DRYOPTERIS SPINULOSA (Muell.) Ktze.

Moist woods; infrequent.

Lake George (Mrs. S. W. Russell) (Kemp) (Jelliffe) (Hulst); near Lake Desolation (E. A. Burt), 1880; southern W. Fort Ann; woods north and east of Kingsbury; woods north and east of Hudson Falls; Ballston Lake; Vischers Ferry; north of Cambridge; about ponds west of Shushan.

DRYOPTERIS DILATATA (Hoffm.) A. Gray

Blue Mt., Hamilton county, at 3000 feet with *D. intermedia.* R. C. Benedict in Torreya **8**: 285. Dec. 1908. This fern undoubtedly grows on some of the higher mountains of northwestern Warren county.

DRYOPTERIS INTERMEDIA (Muhl.) A. Gray

Moist and dry woods; abundant.

Very variable. Fronds evergreen, 2–3 pinnate; pinnules more crowed and dissected than in *D. spinulosa.* The fronds become prostrate in the late autumn. When young, the rachis has a fine granular pubescence. In moist rich old woods, forms occur in which the lower pinnae are broadly unequally ovate.

DRYOPTERIS BOOTTII (Tuck.) Underw.

Moist rich low woods; scarce.

Bear pond, French Mt. (Hulst); Granville (Pember); southeast of Oneida near Halfway brook; north of Glen Lake; southern W. Fort Ann; west of Shushan about Clarks Pond and on Mt. Colfax; north of Cambridge.

Variable. Specimens collected at Podunk Pond, Oct. 17, 1899, have the lower pinnae 2 to 3 inches apart on the rachis. The sterile fronds are evergreen: the fertile nearly so.

DRYOPTERIS CLINTONIANA × INTERMEDIA Dowell

Wilburs Basin, near Saratoga battlefield, Nov. 5, 1907. Determined by Dr. R. C. Benedict, Feb. 6, 1908.

DRYOPTERIS CRISTATA × MARGINALIS Davenp.

Swampy woods north of Cambridge (Dobbin & Burnham), Sept. 17, 1910. Determined by E. J. Winslow, Jan. 23, 1911, who says of *D. Boottii*, growing in the same woods. "*Boottii* has sori near the midvein and indusia glandular. The *cristata* × *marginalis* has sori more widely separated from the midvein, indusia smooth, and very acuminate tips of pinnae."

HUDSON FALLS, N. Y.

(To be continued)

The Ferns and Their Distribution at Douglas Lake, Michigan[1]

FRANK T. McFARLAND

Douglas Lake is located in Cheboygan County, Michigan, seventeen miles south of the Straits of Mackinac. The region is generally level to rolling and has a gentle slope to the southwest. It is drained by many small streams running into Burt Lake two miles to the South and thence into Lake Huron. The topographical outlines of the region are due to the joint action of the moving ice and flowing water during the glacial period.

The climate, as in nearly all the upper part of the lower peninsula, is rigorous in winter and subject to very frequent, sudden and extreme changes of temperature, as much as 50 degrees F. variation being recorded for a period of 24 hours. This sort of weather undoubtedly has much influence on the vegetation exposed above the snow, but since the ferns are covered with a dense layer of snow they are well protected from early winter until late spring. With the melting of the snow, the ferns begin growing vigorously and continue well into the summer. The early summer's climate is ideal for the growth of ferns. Showers are frequent and, combined with the average temperature of 68 F. to 70 F., no better place can be found in the extreme northern parts of the Central States for the collection of wild ferns.

Moraines thoroughly permeate the whole region in all directions and to a large extent determine the flora. Topographically considered, and for convenience, the region will be discussed under the three following topics: (1) The Pine Plains, (2) The Hardwoods and (3) The Bogs.

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[1] Read before the Michigan Academy of Science March 29, 1916.

THE PINE PLAINS

This is the most extensive of the three proposed areas. It is characterized by its sandy soil, the sand in some places being estimated at many feet in depth. This region once supported a heavy growth of Red and White Pine. Since the cutting off of this timber, which occurred about 30 to 35 years ago, forest fires have cleared the plains of brush and small trees and at the present time the region is covered with a dense growth of Fire Cherry, Red Oak, American Aspen, and Large-toothed Aspen, the last species predominating.

The floor of this thicket is covered with a dense growth of *Pteris aquilina, Diervilla lonicera* and *Gaultheria procumbens*, the *Pteris* being most abundant of the three. *Pteris aquilina* was the only fern found growing in the pine plains. This particular species, especially in this region, prefers a sandy soil, and particularly so, if perchance it has been burned over. The manner of propagation, by means of underground rhizomes is very rapid and efficient. In no case were the gametophytes found. Considering that *Pteris* fruited more abundantly than any other species, the only reason to account for the complete absence of gametophytes was the extreme dryness of the soil.

Fires usually do very little injury to this fern as its rhizomes are about eight inches beneath the surface of the earth. The rhizomes are dichotomously branched and as they die away at the older end, the lateral branches become separated from the parent plant, the separated rhizome serving as a starting point for a new plant. In this manner does the Bracken Fern become disseminated more widely.

The Bracken Fern takes very kindly to the intense sunlight of the sandplains and a very pronounced line of demarcation is noted at the edge of the woods. Rarely does one find the Bracken Fern growing in the dense woods in any abundance. It is sometimes found in swales and swampy thickets, and here the plant will sometimes be found to grow to a height of five feet. In the open Pine Plains the Bracken usually measures about two to three feet in height.

THE HARDWOODS

The hardwoods are usually found on the higher elevations and there is a very striking difference between the soil composition of this region and that of the pine plains. The distribution of the hardwoods seem to be governed by the amount of clay and humus in the sand. The more clay, the greater the forest growth and the more pronounced is the fern flora. The entire floor of the forest is covered with a layer of leaf mold to a depth of several inches. The hardwoods are well drained but are always moist beneath the vegetable mold.

Very few areas of the original hardwoods remain untouched, the last active lumbering taking place about 1912. After the timber was cut off, the area grew up to brambles, red-berried elder and if perchance it were burned over, it grew up to *Epilobium angustifolium* and *Erechtites hieracifolia* and, in several places, the areas have been cleared for farming land. The effect of the lumbering and the fires is very noticeable on the distribution of the flora especially that of the ferns. Before the advent of the lumberman and the forest fire, a number of species of ferns were to be found in all the hardwoods, but at the present time the only species to be found in these cut and burned over areas are *Pteris aquilina, Polypodium vulgare, Phegopteris dryopteris,* and *Adiantum pedatum*. *Polypodium vulgare* was found in but one place and then only on a moderately high bank overlooking Douglas Lake to the north.

About two miles southeast of Douglas Lake on the west shore of Burt Lake, there still stands a tract of forest growth which represents the condition of the cut over areas in the past. This tract of hard maple, sweet birch, and hemlock offers the best kind of a home for the ferns of this region. Here are to be found 17 of the 24 species of ferns reported for this region. Owing to the protection offered by these woods, the ferns grow very luxuriantly. Among the largest and most stately is Goldie's Fern, *Aspidium Goldianum*. *Cystopteris bulbifera* was found with fronds three feet long and some of these fronds bore from 25 to 35 bulbils. This species loves a very wet place and in these woods was found most abundantly in the ravines close to the water's edge. *Cystopteris fragilis*, unlike its sister species, was found only in the drier locations and this was at the source of the ravines. Higher up on the sides of the ravines, *Asplenium filix-foemina*, the Lady Fern, was found growing in considerable numbers.

Aspidium Goldianum, the largest and most beautiful fern of the region, was found in one station in the summer of 1913 by Professor Smith and in the summers of 1914 and 1915, the writer found them in a large number of new stations, all of them however, in about the same kind of location, moderately moist and shady. *Onoclea Struthiopteris* was found in but one place. This region was along the edge of the Burt Lake woods where a very small area was cleared and fenced off for a pasture. These ferns were browsed off by the cattle each year and the growth for the summer of 1915 was about one half that of 1914. *Adiantum pedatum* was found growing in greatest abundance on upturned soil due to the felled trees.

THE BOGS

Under this heading will be discussed the swamps, marshes and swales. A typical bog in this region is characterized by its growth of Tamarack and Arbor Vitae. The soil is usually acid in reaction and poorly drained, the majority of the species of plants belonging to the Ericads. The trees are *Larix laricina, Thuja occidentalis, Picea canadensis, Picea mariana* and *Taxus canadensis.* The floor of the densely covered bog consists of several species of *Sphagnum* and only in the open and more or less partially cleared areas are the sedges, grasses and liliaceous plants to be found. The trails which were cut through the bogs by the lumbermen represent about the only regions where the ferns grow in any abundance. Sometimes they are to be found rather plentifully along open streams which penetrate the bog. The fern seldom migrates far into the densely shaded areas and but few of the hardwood species are found. The most common species to be noted was the *Aspidium thelypteris* which does not occur in the hardwoods. Of the *Osmundas, regalis* and *cinnamomea* were found in considerable abundance in nearly all the bogs and usually in the more open areas. *Osmunda Claytoniana* was never seen by the writer in this region but was reported by Professor Smith from Smith's Bog. Scattered throughout the bog were *Aspidium cristatum, Phegopteris polypodioides, Phegopteris dryopteris, Aspidium noveboracense, Botrychium virginianum* and, in 1914, *Ophioglossum vulgatum* was found for the first time. No other species have been found since the discovery of this fern and yet it is quite possible that some species have escaped the eyes of the investigator. *Botrychium virginianum* was the most abundant in the shady areas and presented a great range in size. The smallest of them were not more than 10 cm. high and at times were difficult to distinguish from mature *Botrychium simplex* which did not grow in this region. Another striking feature concerning *Botrychium virginianum* was that it was just as likely to be found growing in the richest woods to a height of three feet as it was in the cold bogs where the soil was extremely acid and cold.

The marshes differ considerably from the bogs, especially in their formation and their location. They are not, as a rule, covered with a dense growth of trees but their vegetation consists largely of shrubs and herbaceous plants. The marsh fern, *Aspidium thelypteris,* is the most common species, while *Osmunda regalis, O. cinnamomea,* and *Onoclea sensibilis* are to be found scattered about the swamps in no definite order. The *Osmundas* are usually found growing very abundantly and luxuriantly near the shaded banks of small streams and it is a very common thing to find them three and a half to four feet high.

FERN VARIATIONS

But one plant of *Cystopteris bulbifera* was found in 1914 which showed any abnormal branching. This plant produced a frond which had a simple stipe, but at the junction of the first pair of pinnae, the stipe divided so that two well formed laminae were produced above the first pair of pinnae. It was also interesting to note that each frond bore bulbils as if a normal frond.

Besides the young plants of *Botrychium virginianum* of the Bogs, it was noticed that the young plants of *Botrychium ternatum intermedium* of the hard woods so resembled the young plants of *B. virginianum* that it was sometimes difficult to tell the species.

The ferns found growing in each of these regions are as follows:[2]

PINE PLAINS: *Pteris aquilina* L.

HARDWOODS AND CLEARINGS: *Polypodium vulgare* L., *Phegopteris polypodioides* Fée, *Phegopteris dryopteris* (L.) Fée, *Adiantum pedatum* L., *Pteris aquilina* L., *Asplenium filix-foemina* (L.) Bernh., *Aspidium Goldianum* Hook., *Aspidium spinulosum,* (O. F. Muller) Sw., *Cystopteris bulbifera* (L.) Bernh., *Cystopteris fragilis* (L.) Bernh.

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[2] Nomenclature as in Gray's Manual, Seventh Edition.

Onoclea sensibilis L., *Onoclea Struthiopteris* (L.) Hoffm., *Botrychium lanceolatum angustisegmentum* Pease & Moore, *Botrychium ramosum* (Roth) Aschers., *Botrychium ternatum intermedium* D. C. Eaton, *Botrychium ternatum rutaefolium* (A. Br.) D. C. Eaton, *Botrychium virginianum* (L.) Sw.

BOGS AND MARSHES: *Phegopteris polypodioides* Fée., *Phegopteris dryopteris* (L.) Fée, *Aspidium Thelypteris* (L.) Sw., *Aspidium noveboracense* (L.) Sw., *Aspidium cristatum* (L.) Sw., *Cystopteris bulbifera* (L.) Bernh., *Onoclea sensibilis* L., *Osmunda regalis* L., *Osmunda Claytoniana* L., *Osmunda cinnamomea* L., *Ophioglossum vulgatum* L., *Botrychium virginianum* (L.) Sw.

DEPARTMENT OF BOTANY,
UNIVERSITY OF KENTUCKY.

Standley's Ferns of Greene Co., Mo.

BENJAMIN FRANKLIN BUSH

I have recently read the interesting paper on the Ferns of Greene County, Missouri, by Mr. Standley, in the AMERICAN FERN JOURNAL for April–June, 1916, and I think a few remarks on the introduction and the notes under several species will be very appropriate here.

In the introduction Mr. Standley gave a short account of the topography, the characteristic rocks and soil, and the names of a few characteristic and extra-limital plants.

It was my good fortune many years ago to have been able to collect in Greene County, Missouri, in company with Mr. Blankinship and Prof. Shepard, and it was on one of my trips there with the former, that the last species mentioned by Mr. Standley, *Othake callosum*, was discovered in Greene County, though at that time I little dreamed that this interesting composite would be later on associated with my name.

To the list of characteristic and extra-limital species given by Mr. Standley for Greene County, I can add *Xyris flexuosa* and *Scleria Torreyana* from about Goose Pond, *Actaea alba* from the James River, *Phacelia dubia* and *P. hirsuta* from Pearl and Willard, *Heliotropium tenellum* and *Portulaca pilosa* from Willard, and *Brauneria paradoxa* from the prairie between Nichols Junction and Springfield.

But it appears to me that Mr. Standley is in error in citing *Micranthes Virginiensis* and *Bumelia lycioides* for Greene County, Missouri. The first was collected by Blankinship between Willard and Graydon Springs, May 7, 1905, No. 1, and named by him *Saxifraga Virginiensis*, but in a short paper on the Missouri Saxifrages in the Annual Report of the Missouri Botanical Garden for the year 1910, I was able to show that the Greene County species was *Micranthes Texana*, a species of the Southwest which extends northeast into southwestern Missouri.[1]

The *Bumelia* given by Mr. Standley must certainly be *B. lanuginosa*, a common tree in some parts of Greene County and all southern Missouri, and not *B. lycioides*, which is a species of swamps of southeastern Missouri to Louisiana, Virginia, Florida and Texas.

In his notes under *Notholaena dealbata*, Mr. Standley says: "This is a Southwestern species which reaches the northeastern limit of its range in Southern Missouri," a statement which could only have been based on what the Manuals say, and not on actual specimens and local lists,[2] for this species ranges much farther north and east. It is rather common on bare faces of limestone boulders in Jackson County, and I have seen specimens of it from Holt and Platte Counties, nearly 100 miles farther north, Greene has collected it in northwestern Missouri, Tracy in his Flora in 1886, gives it for Boone County, Daniels in his Flora in 1907, gives it for Columbia, it has even been reported from western Illinois near St. Louis, and I have a letter from Dr. Engelmann in which he says it is occasionally found about St. Louis.

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[1] It is interesting to note that Dr. Small in the second edition of his Flora, gives only Texas and Arkansas for *Micranthes Texana*, evidently overlooking my paper on the Missouri Saxifrages cited above.

[2] In a letter dated August 12, 1916, Mr. Standley says that there is no material of this species in the National Herbarium from beyond Greene County.

On a collecting trip with Prof. Shepard in 1885, I saw *Adiantum Capillus-Veneris* along the James River just east of Gates, and farther down the river in Christian County, and Shepard reports it from Greene, Christian and Stone Counties in Tracy's Flora in 1886.

In his note on the range of *Asplenium Bradleyi*, Mr. Standley says "'On rocks e. N. Y. to Ky., "Mo.," and southw.'[3] There is no longer reason to question its occurrence in Missouri, for the specimen from Greene County is undoubtedly this species." There has been no doubt about the occurrence of this species in Missouri with collectors for 25 years or more, it having been collected at Osceola by Van Ingen and Shepard in 1890, by Mackenzie at Bay Mills in 1897, by Russell at Mine La Motte in 1897, at Rolla by Greene in 1915, and at Montevallo by Bush and Greene in 1915.

Mr. Standley very properly eliminates *Asplenium pinnatifidum* from the Greene County flora, as the Greene County citation of Shepard's in Tracy's Flora, was a mistake of Tracy's, Shepard reporting this to me for Missouri, not Greene County, his knowledge of it based on some collection as yet unknown to me. Davenport in his catalogue in 1879 credits this species to Missouri, having specimens in his herbarium collected by some early collector, perhaps by Shepard. Davenport appears to have been followed by Gray, Britton and Brown, Gilbert and Maxon in citing this species for Missouri.

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[3] The range in Gray's New Manual, seventh edition, 1908.

I have seen specimens of this species collected by Russell at Mine La Motte, November 10, 1898.

In his remarks on *Equisetum hyemale*, Mr. Standley says: "Only this one species of *Equisetum* is known to occur in the County," but in a list of Greene County plants prepared for me many years ago, Prof. Shepard gives two species, *E. hyemale* and *E. sylvaticum!* I am referring the last to *E. arvense*, as it is not likely that *E. sylvaticum* occurs in Greene County, and it seems almost impossible that *E. arvense* should be absent from the Greene County flora.

At the time Prof. Shepard collected *Equisetum* specimens, it was not known that the common evergreen species of Missouri and all the northern and eastern United States, was *E. laevigatum*, Braun's species being long misunderstood, and confused with a then unnamed annual-stemmed species of the western and southern United States, which was taken up as *E. laevigatum*, and Braun's species given a new name by Eaton, *E. hyemale intermedium*. I am therefore referring Shepard's *E. hyemale*, and the *E. hyemale* of Mr. Standley's list, to *E. laevigatum*, as it is more likely to be that, than the true *E. hyemale*, which is now generally conceded not to occur in North America.[4]

That a better understanding of the three species involved in this obscurity may be had, I append the following somewhat descriptive key:

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[4] In a letter from Mr. Standley, dated Aug. 10, 1916, received since the above was written, he says: "The *Equisetum* material which I collected in Greene County I have re-examined with Dr. Maxon, and there is no doubt that it is *E. hyemale intermedium* A. A. Eaton. The cross-section of the stem is very unlike that of *E. laevigatum*, as shown well in the figure accompanying Mr. Eaton's treatment of the genus in Gray's New Manual." But Mr. Eaton's *E. hyemale intermedium* is exactly *E. laevigatum* A. Braun, as shown by one of his co-types in the Herbarium of the Missouri Botanical Garden, and Eaton's *E. laevigatum* was an unnamed, annual-stemmed species.

A. Aerial stems evergreen, sometimes freezing down to the ground in severe winters, rough to a greater or less degree; cones tipped with a rigid point.
  B. Stems bright green; sheaths cylindrical, not dilated upward, usually with two black bands, sometimes entirely black; stems rough, tuberculate; not American.
  1. EQUISETUM HYEMALE L.[5]
  B. Stems yellowish green; sheaths elongated, dilated upward, with a narrow black band at the top and frequently with a second irregular one below; stems smoothish, only slightly tuberculate; widely distributed in America.
  2. EQUISETUM LAEVIGATUM A. Br.[6]

A. Aerial stems annual, smooth; cones without a point; stems usually unbranched, except when broken; sheaths elongated, dilated upward, with a narrow black band at the top, rarely with a faint second one below; western and southern United States.
  3. EQUISETUM KANSANUM Schaffner[7]

COURTNEY, MO,.

A New Station for Scott's Spleenwort

CLARA G. MARK

While on a fern-collecting trip in the southern part of Hocking County, Ohio, last July, the writer found a single plant of Scott's Spleenwort, *Asplenium ebenoides*, growing on the face of a ledge of sandstone. This county is an interesting one botanically and has been for years a favorite collecting ground for the botanists of central Ohio. Twenty-two years ago Dr. W. A. Kellerman collected a plant of this species from a sand-

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[5] EQUISETUM HYEMALE L, Sp, Pl, 1062. 1753.

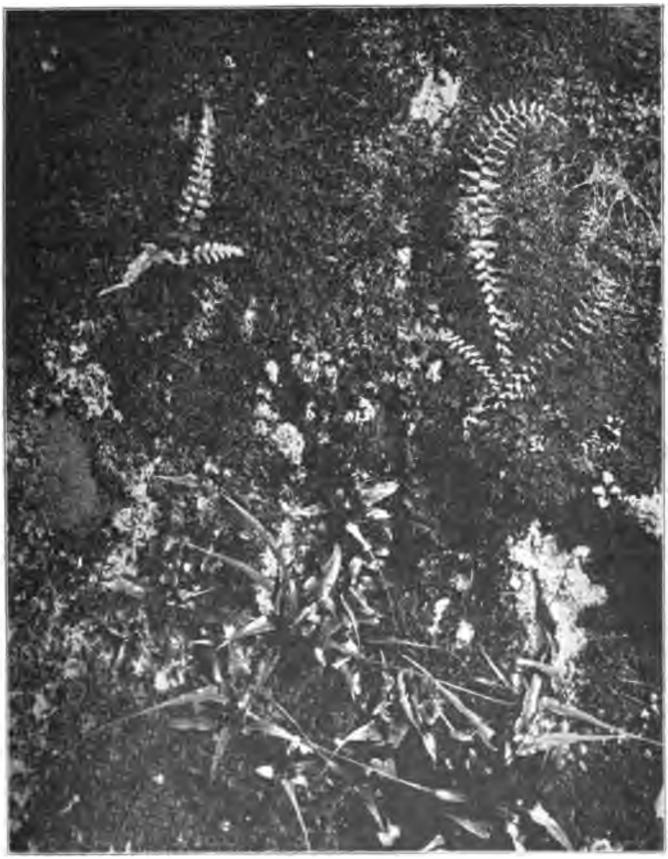
[6] EQUISETUM LAEVIGATUM A, Braun: Engelm, Am, Journ, Sci, **46:** 87, 1844.

Equisetum hyemale Am. Auct. in large part, not L. 1753.

Equisetum hyemale intermedium A. A. Eaton, Fern Bull. **10:** 121. 1902 in part.

[7] EQUISETUM KANSANUM Schaffner, Contr. Bot. Lab. Ohio State Univ. No. 70. Nov. 1912.

Equisetum laevigatum A. A. Eaton and Am. Auct. in part, not A, Braun, 1844.



Scott's Spleenwort growing on smooth mossy face of sandstone cliff, in association with Ebony Spleenwort and Walking Fern.

stone cliff in the northern part of the county, about twenty miles from where the one was found this summer. That is the only record given in the state herbarium of any earlier occurrence of the species in the state.

Throughout the greater part of Hocking County the bed rock is a massive, coarse-grained sandstone, which forms high cliffs, especially along the smaller valleys. At the heads of the valleys there are in many cases extensive rock shelters formed by the overhang of the sandstone, and in these "caves" and along the cliffs grow many of the smaller rock-loving ferns. Maidenhair Spleenwort and Pinnatifid Spleenwort are two of the most common species, the former growing usually on moist or dripping rocks, the latter in niches on the drier ledges. Both of these species grow most commonly on ledges pitted and seamed by differential erosion. Mountain Spleenwort occurs occasionally in a similar habitat. Where a comparatively smooth face of a cliff has become covered with moss Walking fern is sometimes found in dense mats. On such a mossy cliff and associated with the Walking fern was found the specimen of Scott's Spleenwort. At the top of the ledge was a colony of Ebony Spleenwort, and one plant of that species was growing on the face of the cliff near the specimen of Scott's Spleenwort. The association of the three species is shown in the photograph.

At first glance the plant of Scott's Spleenwort somewhat resembled Pinnatifid Spleenwort, but closer examination revealed the black color on the rachis and the thinner texture of the blade, while the segments were more irregular and some of them more pointed than in the commoner species. Perhaps the most readily noticeable difference was in the habitat and manner of growth. The Scott's Spleenwort has a more erect and spreading habit, while the Pinnatifid is characteristically a somewhat drooping species. Also the growth of the Scott's

Spleenwort on the smooth mossy face of the cliff is in distinct contrast to that of the Pinnatifid Spleenwort in dry niches and pockets of the cliffs.

OHIO STATE UNIVERSITY, COLUMBUS, OHIO.

The Polypody

LILLIAN A. COLE

On May 20, 1916, I drove to Sennebec pond in Knox County, Maine, fastened my horse in somebody's door yard and then walked along a field road shaded by trees and carpeted with young ferns.

I ascended a hill of 500 feet elevation and found flowers and ferns that were a delight. Previously I had hunted for *Viola lanceolata* in low lands, for the books had told me to do so, so great was my surprise, when I found it on the summit of this hill of ledges, exposed to the sun's rays nearly all day.

Wending my way down to a brook in a ravine, I found a real fern garden—Nature's own production and handiwork. With difficulty, over wet stepping places and among brambles, I came to a boulder in that brook and found some polypody ferns that looked different than any I had ever seen. The fronds were larger, darker green, more lance-triangular, and as I turned them over, instead of the great big staring fruit dots I found small sori. I wondered if I had made a discovery of a new variety for our country.

These plants grew on an angle of the rock of but few degrees slant. They were directly over the water and were shaded by the surrounding trees.

I wondered how they could cling and thrive so well. In the careful effort to remove a few specimens, I fairly lifted a sheet of their intertwining roots, with a very little soil of leaf mold and sand which they were holding for themselves.

I sent a specimen of these polypodies to Mr. Jay G. Underwood of Hartland, Vt., and this is what he says about them:

"With regard to the Polypody would say this fern does vary very much according to its habitat. I have found forms in cold ravines, that are similar to the one you sent. Botanists do not, in this country, recognize these as of any definite difference requiring names. I think that in England a good many of these forms have been given names, but nothing of the sort has been attempted here, probably because the forms intergrade and do not seem to breed true."

So, now, I meditate upon the misfortune of the little Polypody's fate of being reared and thriving in our uncrowned Republic, when if living under the skies of the crowned Kingdom they might be given a name of their own. The brook still gurgles beneath their feet, and the rustling leaves over their canopy of green still whisper the name, "Polypodium vulgare."

UNION, ME.

Notes and News

An old letter, written in 1836 by Dr. Joseph Barratt of Middletown, Conn., to Dr. Torrey and now preserved at the New York Botanical Garden, contains an apparently unpublished detail in regard to the discovery of the hart's-tongue fern in central New York by Pursh. Dr. Barratt writes:

> "I was glad to hear you had discovered *Scolopendrium vulgare* in N. Y. Some years since I conversed with Mr. J. Geddes about this fern. He told me he was with Pursh at the time he found it, and he exclaimed: 'I am better pleased at finding this plant than a five dollar bill.'—Mr. G. said it was near but not upon his premises."

In another letter Dr. Barratt records with enthusiasm his first sight of "that rare and beautiful fern, *Hydroglossum* [now *Lygodium*] *palmatum*." He makes the interesting observation that the stems appear to twine both ways. Has anyone noticed this since?

By the will of the late John T. Morris, of Philadelphia, his beautiful estate at Chestnut Hill will become, in due time, the site of a botanic garden, a museum of natural science "with special emphasis upon botany," and a school of practical horticulture. The garden is to be not merely a show place, but is to provide training for the students of the school, and the museum is also to contribute to that end. Students are to receive tuition, clothing and living expenses during a course of at least three years. The residue of Mr. Morris's estate, after other bequests are paid, is left as an endowment fund for the institution; and the provisions of the will become effective at the death of his surviving sister.

The special interest of all this for the fern-lover lies in the fact that Mr. Morris had a fine collection of ferns, both hardy and hot-house species, and that the permanence and development of this collection are now assured.

CAN FERNS BE IDENTIFIED BY TASTE?—At the Columbus meeting of the American Association for the Advancement of Science, Prof. E. T. Reichert discussed before a botanical meeting "The specificity of proteins and carbohydrates in relation to genera, species, and varieties,"* or in other words, the chemical differences between different kinds of plants. He reported the existence of recognizable differences, even in the case of closely related forms, but the differences in such cases were not as great as when the forms were less closely related. On the other hand, the chemical compounds of the species and varieties of a given genus were found to resemble each other markedly when compared with the compounds of a distinct genus. That is, genera, species, and varieties differ from each other chemically as well as in external and internal structure.

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* For a printed account of the subject, see Am. Jour. Bot. 3: 91–98. March 1916; also Carnegie Bulletin, No.

This discovery has practical possibilities. I do not refer to the possibility that in the future, the floral manuals will be likely to key out the plants described by chemical means, although that is already done in the case of "flowers" like *Bacillus Coli-communis*, *B. dysentericus*, and *B. typhosus*, et al., which can not be otherwise distinguished, except as to their effects. It is conceivable, however, that in cases of adulteration, a knowledge of the chemical character of possible adulterants might be of assistance.

Prof. Reichert had nothing to say about chemical differences among ferns. To supply that deficiency I would like to suggest a means by which readers may investigate for themselves. The simplest means of testing chemically is by the taste. It has long been an observation of mine that ferns are all alike, as far as I have investigated, in taste, and that they have a distinctive taste. This general fact, if established, might be of value to the fern tyro, and help him to separate ferns and carrots. It would have helped me about twenty years ago when I spent an hour or more trying to find among a patch of young Herb-Robert some leaves which I could call sterile leaves of slender cliff-brake.

As far as ferns are concerned, I am sure the investigation would be perfectly safe. The most interesting point that I would record is that already stated, that ferns in general possess some chemical compound in common which can be distinguished by the taste. It is a fact that different kinds vary in flavor, bitterness, astringency, etc.—but they also agree. Ferns differ, however, from lycopods, and equisets, which do not have this taste. The *Ophioglossaceae* have it to a slighter extent, I believe, as do the water fern-worts. I wish some one would verify or disprove that statement about the *Ophioglossaceae.* Those who wish to learn more about the ferns they already know may be interested to determine whether they can discover specific differences, or generic. Some may come to have the expertness of the tea tasters who can tell whether a given sample of tea was picked on the morning of June third, 1893, or on Sept. 6, in the evening, 1888, or something almost as difficult.

R. C. B.

NOTES ON TWO CRESTED FERNS.—The list of the wild New England ferns seems to be complete, except for new localities to be found. The fern collector has to look for something else, and the hybrids and abnormal forms of ferns open a good field for hunting.

In the British Islands many abnormal forms have been found and with these and plants raised from their spores, a quantity of beautiful abnormal forms have enriched the collections of the enthusiastic fern grower.

In the United States very few abnormal forms have been found so far, but among them and some hybrids found wild, there are some plants of value, apt to produce new forms. The taste for abnormal form growing is not much developed as yet but it is hoped that, when better known, these beautiful ferns will find more admirers.

It was my good luck to find two crested ferns, one *Polystichum acrostichoides* with crested fronds. That plant was described in the *Fern Bulletin,* vol. xx, page

80, as *Polystichum acrostichoides,* f. *cristatum* Clute. The plant was found in the woods among others; since it is in cultivation, only the fertile fronds are crested. From these I raised some sporelings which are now in their third year and I hope will show some crests this next season. Mr. Huss, of Hartford, has taken charge of these young plants.

The other is a crested, or more correctly, furcated form of *Asplenium platyneuron.* I found it growing on a bank near an old cemetery. There was a little colony among the ordinary ones which covered the whole bank. Like *Polystichum acrostichoides,* only the fertile fronds are furcated. I removed a few plants to the fernery, and from them I had good spores, which are now in the prothallium stage and will show better what they will do. They are also in Mr. Huss's care.

AMADÉE HANS.

MORE ABOUT OPHIOGLOSSUM VULGATUM.—Another incidental answer to the question "What is the habitat of *Ophioglossum vulgatum?*" has just been published by Miss Norma Pfeiffer* in connection with an account of some prothallia of this species found near Chicago. The species was found in two localities, one moist, and subject to flooding, the other drier. The prothallia were found only in the moist situation, and the suggestion was made that probably only in moist places are the spores able to develop into prothallia. A correlated suggestion was made that in dry places reproduction must be by means of buds from the roots. Another observation recorded was to the effect that in the moister locality, the spores were discharged practically two weeks earlier than in the other. The prothallia were found to be as before described by Bruchmann; viz., erect, blunt, knobby, rootlike structures. It was noted that the roots were usually horizontal in position, pointed, and smooth, as well as longer. Very few were found and it was necessary to sort these very laboriously from the soil. It was noted that Bruchmann to obtain the seventy prothallia upon which he worked, had to spend thirty-five days digging and sorting.

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* Bot. Gaz. **61:** 518–522. 15 June 1916.

Has any reader ever made observation on variations in fruiting time as related to moistness of the situation? Has anyone ever seen young plants developing from the roots?

R. C. B.

FERN LEAVES AT FIFTY CENTS APIECE.—These are not leaves of the rarest fern in the world about which Mr. Bates has asked but fresh greenhouse-grown leaves which are sold for decorative purposes. The particular ones in mind are from *Polypodium Mandianum*, a form of the common tropical *P. aureum* (*Phlebodium*), produced by W. A. Manda, S. Orange, N. J. A single plant stem produces only a few leaves a year, but as these will remain fresh for a long time, they are valuable in decorating. The variety differs from the species in having beautifully frilled or ruffled pinnae. Leaves of *Nephrolepis* varieties are similarly used but do not bring as high prices, as they are produced more freely. So also are certain tropical adiantums, the cut leaves of which are used in bridal bouquets, for example. J. J. M. Farrell has an article in a recent number of the florists' weekly, Horticulture,* telling how to grow maidenhair for this purpose.

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* Vol. 23: 851. 24 June 1916.

American Fern Society

THE SUMMER MEETING AT NEWFANE.—There were only a few clear days in the month of July, but some of these fortunately coincided with the date of the Newfane meeting, which added much to the comfort and pleasure of the visitors. Headquarters were at the cabin of Dr. A. J. Grout, on Newfane Hill, a high point commanding an extended view of the southern section of the Green Mountains. The party assembled here on the evening of July 17th, and started promptly on the following morning for a tramp of some sixteen miles. Botanists from camps along the route coalesced with our company, which was afterward joined by a delegation from the valley, led by Dr. C. D. Howe. The first stop was at a meadow where *Ophioglossum* grew, and search for this interesting plant was abundantly rewarded. Later, *Botrychium lanceolatum* and *B. ramosum* were seen frequently. At one station the writer noticed more than fifty plants of these two species growing in a single colony. Lunch was enjoyed at a cascade in Baker Brook, where a photograph of the party was taken by Mr. L. A. Wheeler, who later thoughtfully sent copies to all concerned. In the afternoon, the route lay along a wooded slope, where the rare *Polystichum Braunii*, *Aspidium Goldianum* and *Asplenium angustifolium* were seen growing in abundance.

Lack of space precludes further reference to the profusion of flowering plants or the mountain scenery; but this note would be incomplete without mention of the gracious hospitality of Dr. and Mrs. Grout. The evenings on the broad veranda of their cabin were something long to be remembered, and the July moon, which flooded the wonderful landscape with its radiance, added the final charm to the scene.

The Society's thanks are due also to Mr. Wheëler, who was associated with Dr. Grout in making the arrangements for the meeting.

R. W. WOODWARD.

The gathering at the Newfane meeting was not as large as it should have been in response to Dr. A. J. Grout's generous offer of the free use of his camp on Newfane Hill. But those of us who happily were able to attend will not soon forget the pleasant days spent at Newfane, nor the kind hospitality of Dr. and Mrs. Grout. The promised "assets" were found to come fully up to all expectations. Moss-rock Cabin, which is perched on the very top of the hill, commands a beautiful and extensive view of the surrounding mountainous country. Dr. Grout's little private lake, with its promise of good fishing and shining like a jewel in the sunlight, lies in the valley a few hundred feet below. Birds innumerable in the nearby spruce trees kept up an almost continous chorus, the clear, sweet notes of the hermit thrush predominating, and in the rich woods were indeed "many ferns."

An all-day outing had been arranged for Tuesday, the 18th, and Dr. Grout loaned his horse and buckboard to carry, when practicable, such of the party as were not accustomed to long tramps. And so—driving, walking, climbing, scrambling and always collecting—in field and wood and by-way—the morning passed all too quickly.

Lunch was eaten seated on a large boulder at the edge of Baker Brook and close to a little cascade and the musical sound of rushing water splashing into the pool beneath was a delightfully refreshing accompaniment, on the warm summer day, to our *al fresco* meal.

Luncheon over, we started off again in a new direction and returned to camp for supper, well satisfied with the day's results. Besides ferns, mosses, grasses and wild flowers had been collected. On that day and the following ones almost all the ferns attributed to that locality were found, and one new one. Many of them were of unusually luxuriant growth—for instance, plants of *Aspidium spinulosum intermedium* with fronds 36 inches long and 14 wide; *A. marginale* almost, if not quite, as large; giant *Botrychium virginianum*, one of which, with a stem as thick as one's finger, bore three fertile spikes; etc.

Following is a list of the ferns noted: *Adiantum pedatum*, *Aspidium Goldianum*, *A. marginale* and var. *elegans*, *A. noveboracense*, *A. spinulosum* and var. *intermedium*, *A. Thelypteris*, *Asplenium angustifolium*, *A. acrostichoides* *A. Filix-femina*, *A. Trichomanes*, *Cystopteris fragilis*, *Dicksonia punctilobula*, *Onoclea sensibilis*, *O. Struthiopteris*, *Osmunda regalis*, *O. cinnamomea*, *O. Claytoniana*, *Phegopteris Dryopteris*, *P. polypodioides*, *Polystichum acrostichoides*, *P. Braunii*, *Polypodium vulgare* and a variety, *Pteris aquilina*, *Woodsia ilvensis*, *Botrychium lanceolatum*, *B. matricariaefolium*, *B. obliquum* and var. *oneidense*, *B. virginianum*, *Ophioglossum vulgatum*.

F. E. CORNE.

There will be a meeting of the Society, in connection with convocation week of the American Association for the Advancement of Science, at the Brooklyn Botanic Garden on the afternoon and evening of Friday, December 29th. The afternoon session, at 2 P. M., will be devoted to visiting, under the guidance of Dr. Benedict, the fern collections at the Garden, including that of the Society and, especially, Dr. Benedict's collection of varieties of the Boston fern. Following this will be an informal, inexpensive dinner at some restaurant, perhaps in Chinatown. Members who are unable to attend in the afternoon, but who wish to join the party at dinner, can find out place and hour by telephoning the Garden—Prospect 6173—during the afternoon. The evening session will be at 8 P. M. Details of the program are not yet worked out; but there will be an exhibit of interesting specimens, brief talks by various members and opportunity for discussion. One of the chief objects of such meetings is to give members an opportunity to meet one another; and it is planned to have this one informal throughout, with plenty of chance for everyone to talk with others present, exchange notes, ask questions and get acquainted. Come and bring your friends—for the meeting will be open to all who are interested in ferns, whether they are members of the Society or not.

Members are urged to send in for exhibit mounted specimens of interesting ferns and fern allies. These would be sent to the Brooklyn Botanic Garden, Brooklyn, N. Y., in time to arrive before December 29th. Packages should be marked "For the American Fern Society." Exhibits will be well cared for and returned immediately after the meeting.

Further notice will probably be sent to members living within easy reach of New York; and to all others who will ask the Secretary for it.

Rev. James A. Bates, one of the few remaining charter members of the Society and once its president, died at his home in South Royalston, Mass., on September 3, 1916. An account of his life will appear in the next number of the JOURNAL.

Mr. James A. Laird died at Rochester, N. Y., on July 17, 1916, aged 44. He was born at Trenton, Ontario. For the past twenty years he had lived at Rochester, and for all that period had been in the employ of the Stecher Lithographic Company. Much of his spare time was spent in the pursuit of natural history, in several branches of which he was keenly interested—an interest which his wife shared with him. He had gathered a collection of insects and a large and fine one of ferns and flowering plants. Not long ago he gave 1500 mounted sheets of the latter to Rochester University. He was a member of several natural history societies.

Mr. Bigelow's sets of species and hybrids of *Dryopteris* are nearly ready—in fact, may have been sent out by the time this reaches our readers. It has been found impossible, in one collecting season, to get enough material of some of the rarer hybrids for all of the more than thirty sets ordered; these hybrids will therefore be distributed, as evenly as possible, among the different sets, some in one, some in another. A word as to the system of numbering used may not be out of place. All specimens of the same species or hybrid bear the same arabic number. When, as in most cases, the specimens have been collected by different persons, at different times and places, the separate collections are indicated by lower case letters following the number. Thus, all specimens of *D. Clintoniana* × *intermedia* are given the number 3, the different collections included being designated as 3a, 3b, etc.

Our honorary member, Mr. Carl Christensen, has very generously given to the Society a set of all his writings of which reprints were available. This is indeed a valuable gift and one for which the Society owes Mr. Christensen a large debt of gratitude.

Mr. C. A. Weatherby, 1062 Main Street, East Hartford, Conn., offers specimens of *Lygodium palmatum* to members for postage.

Changes of address:

Hurd, Mrs. Arthur T., 13 Mall Street, Salem, Mass.
Marshall, Dr. Ruth, Lane Technical School, Sedgwick and Division Streets, Chicago, Ill.

New members:

Anderson, Miss Mary L., Lambertville, N. J.
Brandegee, Arthur L., 61 New South Street, Northampton, Mass.
Bray, Dr. William F., 1005 Harrison Street, Syracuse, N. Y.
Evans, J., Grant Orchards, Wash.
Phair, Miss Gertrude G., 804 East 19th Street, Brooklyn, N. Y.
Sanborn, Miss Sarah F., 54 Center Street, Concord, N. H.
Steil, Dr. William N., 2217 Hollister Street, Madison, Wis.

The annual election resulted in the adoption of the proposed amendment in regard to honorary members and the election of the following officers for 1917: *President*, William Palmer; *Vice-President*, Mrs. Mary Adam Noble; *Secretary*, C. A. Weatherby; *Treasurer*, J. G. Underwood. The full report of the Judge of Elections will be printed with the officers' reports in the next number of the JOURNAL.

A living specimen, or specimens, of *Lycopodium Selago* is desired by the Brooklyn Botanic Garden, either by gift, by exchange for other living material, or by purchase. The specimens, or information as to where they may be obtained, should be sent to Dr. C. Stuart Gager, Brooklyn Botanic Garden, Brooklyn, N. Y.

Last year's increase in the number of members has made it possible to issue this forty-page number of the JOURNAL. With fifty more members, or an annual income of fifty dollars secured in some other way, we could have as large a one every time.

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ERRATUM

Page 54, line 8, for *Botrychium dissectum elongatum* read *Botrychium obliquum elongatum.*

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R. C. BENEDICT, Editor
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